TANKER FUEL CONSOLIDATION:
IMPACT OF FUEL EFFICENCY ON ATO RESILIENCY

GRADUATE RESEARCH PROJECT

Scott C. Linck, BS, MAS

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DEPARTMENT OF THE AIR FORCE
AIR UNIVERSITY

AIR FORCE INSTITUTE OF TECHNOLOGY

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Scott C. Linck, BS, MAS

Major, USAF

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Scott C. Linck, BS, MAS

Major, USAF

Approved:

//SIGNED// 3 JUNE 2011

Dr. Alan Johnson, PhD, Advisor Date

Associate Professor of Logistics and Supply Chain Management

Department of Operational Sciences

AFIT/IMO/ENS/11-07

Abstract

The United States Air Force is committed to purchase the most capable and efficient tanker available to replace its aging KC-135 fleet. One capability demanded of the new tanker is the ability to receive fuel from other tankers while airborne, a practice referred to as fuel consolidation. Under the operating constraint of reduced budgets and continuing pressure to reduce Air Mobility Command’s overall fuel costs, it is likely that future planners will attempt to utilize fuel consolidation to minimize the number of tankers needed for a given Air Tasking Order (ATO). This study examines the impact of consolidation in both a free and altitude restricted paradigm within specific anchors. It identifies the employment method which generates the greatest amount of operational efficiencies while examining the changes in associated receiver mission risk. It recommends the use of 'track jumping' to achieve the greatest levels of operational efficiency and suggests Air Mobility Command planners begin using consolidation as soon as available both to explore the paradigm and reduce fixed costs within air campaigns.

Acknowledgments

I would like to thank Mr. Pete Szabo, AMC/A9, for sponsoring this research. Had he not suggested this research topic, I would likely still be wondering where to focus my efforts. I must also thank Dr. Alan Johnson, my thesis advisor, for his excellent guidance and patience during the development of this study.

Scott Linck

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I. Introduction

Background and Motivation

The Air Force is the largest consumer of energy in the Department of Defense. In Fiscal Year (FY) 2008 the Air Force spent $9 billion to fuel aircraft and vehicles in addition to the resources required to power its facilities and installations (Air Force Energy Plan, 2010:4). The resources needed to support these fuel requirements are sourced from areas of the world that struggle with national stability and security. Many of the nations that control access to these essential resources hold markedly different political and societal world views than that of the United States. If these countries align themselves against our nation they could potentially cut off access to these resources and, in turn, impact our ability to act globally in support of national policies.

Recognizing this vulnerability, the Secretary of the Air Force outlined a goal to reduce the consumption of aviation fuel 10% by the year 2015 against a FY2006 baseline (Air Force Energy Plan, 2010:3). This goal has placed pressure on all Air Force agencies, forcing organizations to realize available fuel efficiencies. Air Mobility Command (AMC) has identified the potential for fuel savings in its ability to 'pool' fuel between tankers.

The Air Force recently selected the Boeing Corporation to build a tanker fleet to replace the Air Force's aging KC-135 fleet, the KC-46A (DoD News Release, 2011). One capability required of the new tanker is the ability to receive fuel from other tankers while airborne (KC-X Tanker Modernization Program, 2011) a practice referred to as fuel consolidation (Bolkcom, 2008:9). The value of this ability was proven through the consolidation capable KC-10's recent performance in the Afghanistan and Iraq campaigns. Michael Isherwood highlighted this fact in the September 2007 issue of Armed Forces Journal:

> Because most tankers do not offload all their fuel during a mission, mobility planners have the excess fuel passed to Air to Air Refueling capable KC-10s. This concept extended the KC-10 on-station time by roughly 80 percent. With extra station time and fuel, KC-10s conducted unscheduled air refueling on 35 percent of their missions . . . this practice decreased required air refueling missions by at least 20 percent (25).

AMC/A9 generated a number of studies to validate Isherwood's claim of 20 percent mission reduction through fuel consolidation. When applied to 'small' engagements with limited airfield availability, the models achieved the 20 percent reduction target but efficiencies eroded to 5 percent once the models grew to fit the scale of our recent engagement in Iraq (Szabo, 2010). This study reexamines Isherwood's premise. If proven, fuel consolidation may significantly reduce the number of tanker missions required to meet mission requirements. This may have a negative secondary effect, however. Every mission eliminated through consolidation potentially reduces flexibility and increases risk in the remainder of the schedule.

As tankers consolidate fuel, and consequently reduce the number of required refueling missions, planners produce a very efficient schedule that becomes increasingly brittle. The loss of one tanker may have an increased impact on the remaining tankers and receivers in a given schedule or Air Tasking Order (ATO). This balance between efficiency and risk defines the resiliency of a given schedule. Planners must ensure the schedule is flexible enough to rebound from losses while remaining cost effective.

Historically, commanders have dealt with tanker 'losses' in real time, leveraging planner experience within Air Operation Centers (AOCs) to marry remaining fuel supplies with receiver needs. The challenge facing Air Mobility Command is how to best employ the fuel consolidation ability of the KC-46A while still maintaining the needed amount of schedule resiliency.

This study quantifies the amount of risk assumed if planners implement fuel consolidation within an air campaign. This information may prove invaluable to strategists trying to employ the Air Force's tanker force in future conflicts.

Problem Statement

What impact will tanker fuel consolidation have on mission risk and the overall resiliency of an air campaign?

Research Questions

This paper focuses on the following research questions.

1. What level of efficiency can be realized through an emphasis on tanker fuel consolidation?
2. How does the reduction of tanker sorties impact mission risk?
3. How should fuel consolidation be utilized in future conflicts?

Methodology

The researcher received data for this effort from AMC/A9. Mr. Pete Szabo generated an ATO approximating the size of a daily sortie load for the recent Iraq air campaign. The provided schedule consists of 724 receiver fuel requests, 222 tanker sorties, with a refueling requirement of over 14 million pounds of fuel.

The KC-135 (with the exception of a small number of special operations aircraft) is unable to receive fuel from tanker aircraft while airborne. For the purposes of this study, the researcher assumes that all KC-135 aircraft in the schedule provided are able to receive fuel during flight and are capable of fuel consolidation. This assumption is necessary to study the effects of fuel consolidation on an ATO of this size. All other aircraft information, for both receiver and tanker aircraft, mirrors that of their real world counterparts. The researcher assumes that all KC-135s with fuel remaining after receiver refueling requirements are met will consolidate this 'extra' fuel with the next tanker aircraft to arrive at its current refueling anchor. Fuel will be transferred from the losing aircraft until the receiver reaches its internal fuel limit of 200,000 pounds, or until the losing aircraft reaches its minimum fuel reserve to accomplish a safe recovery and landing.

A simulation is then used to determine the minimum number of KC-135s needed to support the given ATO when consolidation is emphasized throughout the schedule. This number is compared to the number of tankers required in the non-consolidated schedule. This analysis allows for a greater understanding of the connection between consolidation and the increased risk of the remaining receivers relying on fewer tankers.

Assumptions

The researcher assumes that the schedule provided by AMC/A9 is a realistic ATO scenario, similar in size to an Iraq sized tanker requirement. The model assumes the KC-135 aircraft used possess the ability to consolidate fuel. No attrition for external factors are included (weather, maintenance reliability rates, etc.) as these variables are difficult to quantify and would unnecessarily limit the scope of the effort.

Limitations

This study examines historic and/or theoretical data and may not be applicable to future conflicts. The ATO used for this research mirrors the size of the Air Force's most recent conflict in Iraq. If future conflicts differ in size, the resulting efficiencies and ATO flexibility conclusions may prove different than those of this study.

II. Literature Review

Introduction

This chapter begins by examining the concept of air refueling concepts and employment. This follows with a dialogue regarding the studies which discuss the modeling of air refueling and areas for potential fuel savings. Next, a discussion regarding the modeling approach to decision making, the rationale underpinning the model used, and how specific models were implemented previously to make decisions regarding networked systems. A short discussion regarding the Arena simulation program and the utility it brings to the decision making process follows. An examination of risk, resilience, and operational slack concludes the chapter.

Air Refueling

The body of research regarding the subject of air refueling and fuel consolidation is limited. Enough exists, however, to form a foundation of common understanding. To fully understand the importance of air refueling some basic concepts must be defined.

The process of Air Refueling and its purpose is best defined by Air Force Doctrine.

> Air refueling is the in-flight transfer of fuel between tanker and receiver aircraft. An aircraft's ability to remain airborne is limited by the amount of available fuel. Air refueling increases the range, payload, loiter time, and ultimately the flexibility and versatility of combat, combat support, and mobility aircraft (1999: 3)

Over time, air refueling has evolved into two 'common' means of employment, track and anchor refueling (Doctrine, 1999:11). Track refueling is most commonly employed in support of intertheater operations. The tanker aircraft can orbit at a designated point and wait for the receiver to arrive, or can time its arrival to meet simultaneously with the receiver at a certain point in space. Anchor refueling is commonly used to support intratheater operations, ones that require many aircraft to share a limited operational space (Doctrine, 1999:11). During anchor refueling the tanker aircraft flies a circular pattern in a specific region and waits for the arrival of receiver aircraft. Although these tracks are primarily designed for the employment of small fighter-type aircraft, it is possible for large aircraft to refuel in these anchor areas as well. Anchor refueling is routinely used in mature air campaigns, such as the ones currently in place over Iraq and Afghanistan. The operational challenge is to plan the air campaign in such a way that ensures mission effectiveness while attempting to optimize the efficiency of the tanker fleet.

During peacetime, air refueling support is distributed through Major Command (MAJCOM) channels. This support is tailored to ensure that all training and proficiency needs are met by both tanker and receiver aircraft (Doctrine, 1999:52). During contingency operations the National Command Authority (NCA) assigns forces based on inputs from the Joint Chiefs of Staff and the Combatant Commander with the objective of meeting the intratheater and intertheater needs generated by the conflict (Doctrine, 1999:53). The needs of the Combatant Commander are further defined to detail specific receiver requirements. Air Refueling assets are then matched to these requirements with specific attention paid to the type of asset supported and utilization rate of both the receiver and tanker assets (Doctrine, 1999:55-56).

Careful planning can increase the capability of refueling assets. Accurate receiver fuel requests are critical as multiple excesses quickly degrade the air campaign's efficiency. Most importantly to this study, multiple receivers and receiver sets must be matched against individual tankers and incorporated with the use of refuelable tankers (Doctrine, 1999:56). Refuelable tankers are capable of receiving fuel from other tankers. This ability increases the overall efficiency of the tanker network as aircraft with excess fuel can pass this extra to other airborne aircraft. This practice can serve to be cumulative if applied to large networks of aircraft over time. Ultimately the efficiencies developed can be so great that a number of tanker sorties can be eliminated from the schedule as the 'excess' fuel in the network can cover a number of existing receiver requirements.

Tanker Employment

A comprehensive study discussing air refueling modeling was accomplished by Air Force Institute of Technology student, Major MacDonald, in 2005. He discovered that tanker *deployment*, the study of using tankers to project force to a distant location, was relatively well studied. There was almost no body of work, however, regarding tanker *employment* (MacDonald, 2005:6).

Tanker employment is defined as tanker support of in theater refueling operations. Simply stated, this covers the operations of tankers launching and recovering to an airfield within the theater of operations. MacDonald provides the following example: "Employment missions entail round-trip flights from in-theater locations. Examples of these are KC-10s out of the United Arab Emirates conducting pre-strike and post-strike air refueling sorties for F-16s flying missions over Iraq" (MacDonald, 2005:7) He further defines the goal of tanker employment modeling as one used to best define the role and use of the tanker once it arrives in theater (MacDonald, 2005:8). This understanding serves to underpin the motivation behind this study; how best to use the capabilities of the tanker once employed in a combat theater.

Tanker Employment Modeling

In his study, MacDonald analyzed many tanker modeling and scheduling programs to determine the one best suited to model tanker employment. Of the programs reviewed, the Tanker Employment Tool (TET) accounted for fuel but failed to address the issue of drogue/boom cycle times and type of mission supported (MacDonald 2005:44). These factors are critical to any employment construct. The second program, AIRPLAN Air to Air Refueling (AAR), includes an accounting of cycle times and mission type, but is not suited to optimize a solution for fuel, time, or any other dependent variable (MacDonald 2005:44). It was therefore determined to be unsuitable for use in a study regarding tanker fuel consolidation.

The non-consolidated schedule provided by Mr. Szabo was created using The Combined Mating and Ranging Planning System (CMARPS). AMC Schedulers use this program to determine the number of tankers required for a specific mission, the best location to source the tanker from, and determine the maximum number of receivers that can be supported by each tanker. (Butler, 2010) After discussion with Mr. Szabo it was determined that the Combined Mating and Ranging Planning System would be poorly suited to solve the fuel consolidation question as there is no existing construct allowing for tanker to tanker refueling (Szabo, 2010). After considering the aforementioned programs, the researcher elected to use a simulation and spreadsheet analysis to determine the impact of tanker fuel consolidation on a given schedule.

Modeling

Modeling is often used to solve complex problems. It can serve to simplify the object or decision problem and allow researchers to gain a better understanding about the issue under investigation (Ragsdale, 2007:3-4). Models can be classified into three different categories: prescriptive, predictive, and descriptive (Ragsdale, 2007:4). Table 1 defines the three types and outlines the ones best suited to specific decision problems.

The approach best suited for the tanker fuel consolidation study is a descriptive one. There is a well defined fuel relationship $f\,(\cdot)$ between the tanker and receiver aircraft; a given amount of fuel will support the demands of a specific receiver set. After fuel consolidation is applied to the schedule however, tankers will be eliminated from the schedule and fuel will be passed among the remaining aircraft. The number of receivers per tanker, the independent variable, is therefore uncertain and dependent on the fuel available from each individual tanker.

Table 1. Categories of Mathematical Models

	Model Characteristics		
Category	**Form of $f(\cdot)$**	**Values of Independent Variables**	**Management Science Techniques**
Prescriptive Models	known, well-defined	known or under decision maker's control	Linear Programming, Networks, Integer Programming, CPM, Goal Programming, EOQ, Nonlinear Programming
Predictive Models	unknown, ill-defined	known or under decision maker's control	Regression Analysis, Time Series Analysis, Discriminant Analysis
Descriptive Models	known, well-defined	unknown or uncertain	Simulation, Queuing, PERT, Inventory Models

Mathematical Models

Several studies have used simulations as the modeling technique to solve problem sets such as the one involving tanker fuel consolidation. Garza (2010) and Vigus (2003) used simulation to analyze complex repair processes. These processes must account for independent variables such as process times, arrival times, inventory levels, etc. (Garza, 2010:18). These variables possessed unknown or uncertain values. Gates simulated the number of aircraft needed to support Marine refueling requirements. The independent variables in this case are also uncertain, involving maintenance failure rates and time variances (2000:5). The tanker fuel consolidation problem is similar to the ones above, involving uncertain independent variables such as changing tanker fuel levels, process times, and receiver arrival times. The demonstrated use of the Arena simulation program in the aforementioned studies and its utility as a descriptive problem solving tool resulted in its selection for use in this study.

Simulation and Arena

Simulation is defined as "a technique that measures and describes various characteristics of the bottom-line performance measure of a model…the objective when running a simulation is to determine the value of a given performance measure when given a set of independent variables (Ragsdale, 2008:562). Arena is one such simulation program.

Arena is a simulation program developed by Rockwell Automation. The user manual describes the program as one "designed for analyzing the impact of changes involving significant and complex redesigns associated with supply chain, manufacturing, processes, logistics, distribution and warehousing, and service systems" (Arena User's Guide, 2007:1). Arena is not an optimization program as it does not determine the most efficient solution set given a limited level of resources (Ragsdale, 2008:17). Arena can, however, provide a solution that closely approximates that of an optimizing program. Individual users must take care to understand this difference and closely monitor their methodology and results to ensure meaningful results are generated.

Arena and Air Refueling

A review of literature associating the use of Arena specifically for air refueling yielded only one substantive article. In 2000, Gates completed a study to determine the number of KC-130 aircraft required to sustain United States Marine Corps combat operations in a two major theater war scenario. Arena was used to determine the number of tankers required to support theater requirements, to include limitations such as maintenance failures and receiver queuing, while waiting for tanker availability (Gates, 2000:1076). It was noted that simulations are somewhat limited when addressing the issue of air refueling as receiver overlap and irregular time requirements are difficult to quantify (Gates, 2000:1080). Gates did, however, develop a strategy to mitigate the issue, using a fixed time to simulate the delay included for the receiver to begin to draw fuel from the tanker. He then included a delay for the receiver to depart the tanker and begin mission execution (Gates, 2000:1076). This tanker consolidation study incorporated these findings, using fixed times to account for time variances.

Risk

Military forces routinely balance risk with the need for mission accomplishment. Risk is defined by the Project Management Institute (PMI) as "an uncertain event or condition, which if it occurs, has a positive or negative effect on objectives. Risk will be considered as discrete occurrences that will negatively affect supply chain flows" (2008).

The Air Force uses an Operational Risk Management (ORM) program to identify and mitigate the impact of risk. Its Operational Risk Management regulation states, "Unnecessary risk comes without a commensurate return in terms of real benefits or available opportunities…The most logical choices for accomplishing a mission are those that meet all mission requirements while exposing personnel and resources to the lowest acceptable risk" (Operational Risk Management, 2000:2). The risk management process employed by the Air Force is outlined in Figure 1.

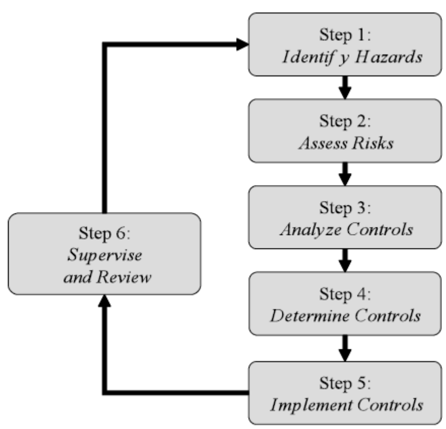


Figure 1. Air Force Operational Risk Management Process (Pettit et.al., 2010)

As the given number of tanker aircraft in a schedule is reduced, receivers rely on fewer and fewer refueling points. Excess fuel is also eliminated. This reduces network agility. There are fewer opportunities for planners to leverage airborne fuel reserves and make changes to scheduled refueling events. This highlights the fundamental assumption underpinning this study: as the number of available tanker aircraft decrease, the amount of risk to the receivers relying on the remaining tanker aircraft increases. In this sense, the level of risk assumed by planners is directly proportional to the number of tanker aircraft eliminated from a given schedule through fuel consolidation. According to the Air Force's guidance on Operational Risk Management, as the force is tailored to meet mission requirements, risk should be minimized (Operational Risk Management, 2000:4). Knowing that risk cannot be eliminated, leaders must direct the use of assets in such a way to minimize the possibility of negative operational impacts. This balance between risk and excess capability can be defined as an organization's resilience.

Resilience

Researchers have noted a direct correlation between resilience and productivity. Most organizations are unable to sustain their productivity levels when subjected to supply chain disturbances. This drop in productivity impacts the organization's competitiveness, and may lead to financial losses. Successful organizations are resilient organizations. They balance capability and risk in such a way that minimizes their exposure to risk, while preserving enough 'excess' resource to react positively to unexpected events. Pettit described the concept of resiliency in 2010. In Figure 2, he highlights the choices companies manage when dealing with resiliency, and the subsequent impacts of balanced and unbalanced resilience on an organization's performance.

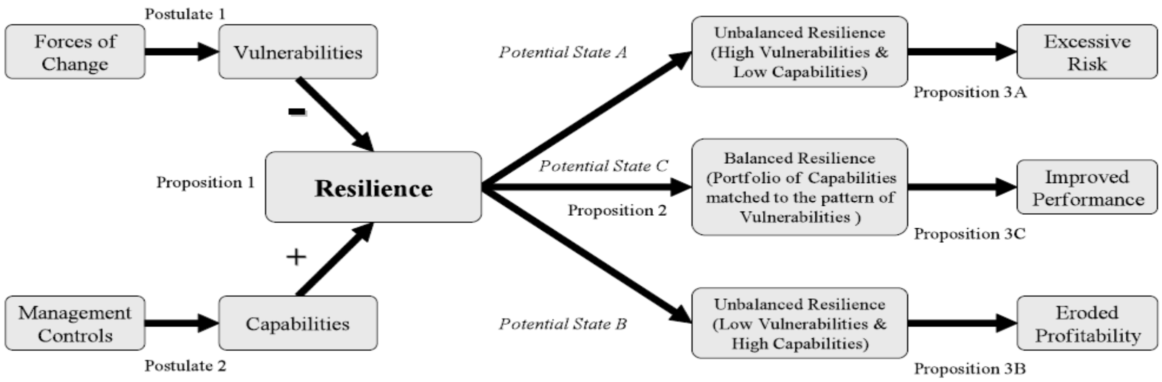


Figure 2. The Resilience Model (Pettit et.al., 2010)

The study of tanker fuel consolidation fundamentally changes the Air Force's supply chain; it creates a fuel connection between all receiver and tanker aircraft. If for some reason a tanker is removed from the schedule, the impact will be felt across the network. The 'excess' fuel from one tanker flows to meet the next receiver's fuel needs. In a non-consolidated schedule, the 'loss' (removal) of one tanker aircraft has a limited impact on the remaining schedule. The receivers originally planned for this tanker will not be able to receive fuel but other receivers, in no way connected with this event, are unaffected. Refer again to Figure 2: if we examine the tanker fuel consolidation model from a resilient perspective, there are three possible outcomes. If planners are inattentive to risk and only seek to minimize the number of tankers used in a given schedule, they may generate potential state A. This results in excessive risk. If planners are risk adverse and attempt to maximize the number of tankers to minimize the 'loss' of a tanker aircraft, they may generate potential state C. This would result in excessive capability and excessive costs for the Air Force. The optimal resilient strategy would follow proposition B. Fuel consolidation should be used to achieve fuel and aircraft savings, but not to the extent that the loss of one tanker would prevent the Air Force from meeting needed mission requirements. This level can be defined as the level of operational slack that the Air Force needs to operate at the inflection point balancing efficiency and risk.

Operational Slack

Bourgeois was one of the first academics to examine the concept of operational (organizational) slack. He defined it in the following manner in 1981:

> Macro-organization theory often attributes an organization's effectiveness to its capacity to absorb environmental variation or buffer its technical core from external environmental influences. This ability to adapt to dramatic shifts or discontinuities in the environment is frequently linked to the absorption mechanism termed *organizational slack* (29).

Operational slack is an excess amount of capacity or resource maintained by an organization. This excess is retained to ensure that customer requirements are met during periods of supply or demand change. In the manufacturing community, operational slack is many times viewed as safety stock, a level of inventory kept on hand to accommodate surges in customer demand or breaks in supply from impacting the organization's ability to deliver a commodity as demanded by the customer. The operational slack in the tanker fuel consolidation postulate is the amount of excess fuel available to receivers at each node of the network. As the consolidation process reduces fuel down to the minimum required to meet receiver demand, it can be stated that operational slack is also reduced. In the non-consolidated schedule, operational slack is represented by excess fuel carried by individual tanker aircraft. Tankers routinely take off with more fuel than required by the receivers they are scheduled to refuel. Planners are able to take advantage of this excess fuel and shift receivers to tankers with excess fuel after both parties are airborne.

This would occur if the supply of fuel was limited for some reason (tanker disruption) or if receiver need exceeded that outlined by the original schedule.

In the consolidated schedule, both time and fuel are limited to what is needed by the original schedule. No significant amount of operational slack is present in either dimension. This study should outline the risk imposed by tanker consolidation and provide Air Force leadership the information they need to balance efficiency with the risk they are willing to assume operationally. This balance can be quantified as the number of tankers[1] added to a fully optimized schedule, or the number of consolidation events avoided to maintain a specific amount of excess in the network. In either case, this excess defines the resiliency of the schedule, the amount of excess that can be used to mitigate disruptions on either the supply or demand portions of the supply chain.

Over the past two decades businesses and industries have embarked upon efficiency initiatives. Theories such as Lean Thinking, Six Sigma, and Air Force Smart Operations (AFSO) 21 have generated pronounced savings for participants. Recent studies have begun to argue that these efficiencies have come at the cost of operational flexibility. Hendricks highlights the following theory in his recent publication *The effect of operational slack, diversification, and vertical relatedness on the stock market reaction to supply chain disruptions:*

> Many researchers and practitioners argue that the severity of the negative economic impact of supply chain disruptions is related to the extent of operational slack with which a firm operates. In the last decade or so many firms have focused on improving the efficiency of their supply chains by eliminating slack and redundancy. However, there now seems to be the recognition that the focus on efficiency may have made supply chains more brittle. This may have had a negative effect on a firm's capabilities to deal with disruptions (2008:234).

[1] Tankers in this instance should be thought of as adding additional fuel and/or time to the schedule

If one accepts this hypothesis, it becomes clear that in an operation such as an air campaign, it is critical not to allow schedules to be optimized purely for efficiency. Operational slack must be preserved within any system to ensure operations can survive supply chain disruptions. It was discussed earlier that military operations are inherently tied to risk. The level of operational slack must mitigate this risk while preserving the efficiencies necessary for military operations to continue. This is illustrated by Figure 3. It suggests that successful organizations, and one could argue, successful military strategies, must be resilient in nature.

Figure 3. Zone of Resilient Operations (Pettit et.al., 2010)

Kleindorfer and Saad (2005) and Lee (2004) suggest that backup systems, excess capacity, multiple suppliers, inventory buffers, and flexibility can lower the probability of disruptions as well as reduce the negative impact of disruptions. Placed in the context of the tanker consolidation issue, this distills down to the following two options; consolidate (reduce tankers required) down to a point which keeps enough flexibility (fuel) in the system to satisfy mission needs or find an inventory buffer. This inventory buffer could manifest itself as an airborne spare aircraft or a ground alert aircraft. This buffer could be strategically placed to cover certain important refueling events, or in the case of a ground alert aircraft, could be launched to cover fuel losses stemming from a tanker failure. These mitigation strategies can be best discussed once risk is quantified. This can be accomplished by comparing the number of tanker aircraft required in a non-consolidated schedule with one that is fully consolidated.

Summary

This section covered background pertinent to the study and discussed modeling, simulation, and the use of Arena to address tanker fuel consolidation. It concluded with a discussion of risk, resiliency, and operational slack.

III. Methodology

Introduction

A notional ATO was simulated to compare the number of tankers required to meet receiver fuel requirements when fully employing tanker fuel consolidation with one using traditional, non-consolidated, tanker sorties. This was accomplished by investigating how 'tankers required' changes in response to conserving airborne fuel through tanker fuel consolidation.

This section begins with a discussion of the schedule provided by AMC/A9 and is followed with a description of the process used to evaluate the impact of fuel consolidation on the problem set. Simulation specifics and a discussion of the Arena program follow. This section describes simulation specifics and with the method used to process the data. The chapter concludes with an examination of time constraints as applied to the problem set.

Background

This study was based on an unclassified ATO spanning a twenty four hour operational period. All receiver activities are supported by KC-135 tanker aircraft. As the KC-135 aircraft (with few exceptions) are not capable of fuel consolidation, the ATO is based on the current principle that the tanker aircraft will not consolidate (share fuel) with other tankers in the schedule. The non-consolidated schedule requires 222 KC-135 sorties to support 724 refueling events. These refueling events are distributed over a notional campaign area based in the Northwestern United States. This area approximates the geographical area of the recent Iraq conflict, and consists of 23 different refueling anchors. Figure 4 captures this area of operations; identifying the refueling anchors (T1, T2, T3, etc. . .) and the tanker launch bases (KA01, KA02, KA03, etc…).

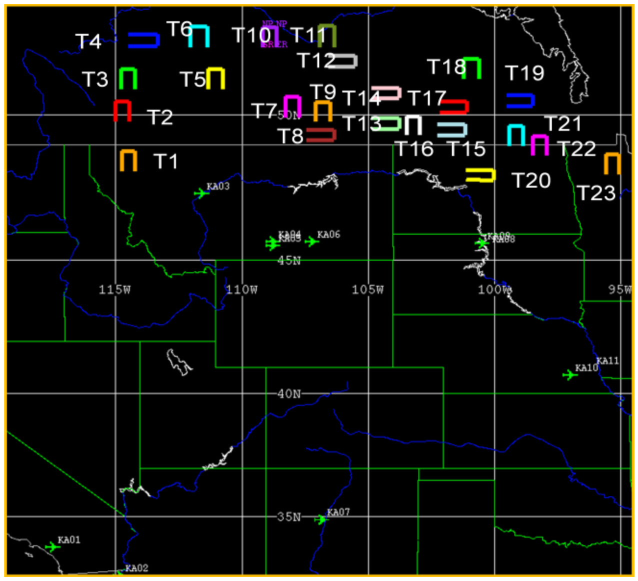


Figure 4. Area of Operations (Szabo, 2010)

The schedule defining these operations contains the same level of fidelity as one generated to support an actual combat operation (Szabo, 2010). Figure 5 includes operationally essential information to include the refueling altitude, scheduled start and end refueling times, type and number of receiver aircraft, fuel required for each refueling event, tanker type, duration of tanker sortie, and location of tanker departure and recovery airfields. The tanker flight plans are connected to specific tanker call signs in an associated document.

TRACK ID	ALTITUDE BAND RANGE	START REFUELING	END REFUELING	START REFUELING	END REFUELING
ANCH10	15000 - 30000	5209N10911W	5209N10838W		

ALTITUDE BAND : 19000

OPTION	TYPE	AR NUM	PACKAGE ID	MISN NMBR	AIRCRAFT NUM/TYPE	START REFUELING TIME	END REFUELING TIME	TOTAL TANKER OFFLOAD	PRE POST IND	TNKR TYPE	TNKR LNCH BASE	TNKR LAND BASE	TANKER LAUNCH TIME	TANKER JOIN TIME	TOTAL TANKER FLT TIME	TANKER FLIGHT PLAN ID
1		1	18137	0434	8 F16C	023 0418	023 0537	37000	PRE							
										K35R	KRIV	KRIV	023 0121	2:57	7:00	AN1901A
		2	18137	0435	6 F16C	023 0552	023 0651	27700	PRE							
		3	18769	0436	8 F16C	023 0659	023 0802	34300	PRE							
										K35R	KRIV	KRIV	023 0255	2:57	7:50	AN1902A
		4	18130	0437	4 F16C	023 0816	023 0847	16100	PRE							
		5	18762	0438	2 F16C	023 0920	023 0932	9000	PRE							
		6	18123	0439	2 F117	023 1023	023 1035	10400	PRE							
										K35R	KRIV	KRIV	023 0519	2:57	8:02	AN1904A

Figure 5. Example Schedule (Szabo, 2010)

Fuel Consolidation

Through discussions with AMC/A9, it was concluded that the consolidation effort should be focused on each individual refueling track (Szabo, 2010). Only the tankers scheduled to perform refueling operations in a given track would be allowed to consolidate fuel. To simplify the analysis, refueling operations were treated serially; a receiver would enter the track at its scheduled refueling time and refuel with an available tanker. All subsequent receivers would refuel with the same tanker until that tanker was unable to support the fuel requirements of a given receiver. The tanker would then consolidate with the next tanker scheduled for the track.

According to the tanker planning AFI, a KC-135 tanker is only capable of offloading 200,000 pounds of fuel (Air Mobility Planning Factors, 2003). Tankers receiving fuel from another tanker were not allowed to exceed this upper fuel limit. Receivers still in the refueling queue would be routed to the next tanker. The receivers would then refuel with said tanker until it is unable to meet a refueling request, upon which an additional tanker consolidation event will occur. This cycle will continue until all receiver fuel requirements are satisfied.

The amount of fuel available from each tanker was derived from the non-consolidated schedule. Each tanker retains a minimum amount of fuel required to return to base after all refueling events are completed. This fuel is defined as 'bingo fuel' and is not made available to receiver aircraft. Almost all tankers in the problem set had 'extra' fuel remaining above bingo fuel after all scheduled refueling events were accomplished. This 'extra' fuel was added to all scheduled receiver fuel offloads to determine the amount of fuel available for offload in the consolidated schedule. Equation 1 defines this process.

$$Fuel\ Scheduled\ for\ Offload\ +\ Fuel\ Remaining\ Above\ Bingo = Fuel\ Available \quad (1)$$

This fully addressed the issue of fuel in the consolidated schedule, but failed to capture both the increased receiver time requirements per tanker and the time required to accomplish the tanker fuel consolidation events.

Time Analysis

To further increase the fidelity of the analysis the researcher compared the original track time (time dedicated for receiver refueling events) for each tanker, with the new refueling time requirements created by fuel consolidation schedule compression. If a tanker was not originally scheduled for a composite refueling time greater than that driven by fuel consolidation, an additional tanker (originally eliminated through the fuel consolidation process) was added back to the anchor. This additional tanker was filtered to ensure its original refueling time requirements covered the excess time required.

The fuel required for internal use by each tanker was also addressed. By using the same loiter time as in the original schedule, the researcher is effectively using a known amount of fuel (the fuel required to keep the tanker airborne for the specified time). This fuel was incorporated into the non-consolidated schedule and was used to determine the total fuel available for offload for each tanker. Keeping loiter time constant maintains the integrity of all other fuel values used in the problem set.

The researcher additionally identified the need to add additional time to account for tanker fuel consolidation and boom cycle time. The tanker fuel consolidation time used was 30 minutes. This allowed for both tankers to reposition, accomplish the fuel consolidation event, and return the receiving tanker to a position where it could continue to refuel receiver aircraft. The boom cycle time requirement was set at five minutes for each receiver aircraft (or set of receiver aircraft). This time allowed for the preceding receiver(s) to exit the anchor and for the incoming set of receivers to acquire the tanker. It should be stressed that the track time for the receiver aircraft was preserved from the non-consolidated schedule. As this time was unchanged, it is realistic to assume that the required receiver refueling time was preserved and that the new schedule is feasible.

Compression Issues

In the consolidated schedule, receivers serially sequence through one tanker as they arrive at a given track. This results in arrival times that are unsupportable. A further assumption of this study involves the deconfliction of arrival times and non-serial tanker fuel consolidation events.

The schedule provided by AMC/A9A was built around receiver time and fuel requirements. Tankers were mated to these requirements at the end of the ATO cycle, driving a tanker requirement above that of a fuel consolidated schedule. If a consolidated schedule is desired, planners would need to account for the increased ratio of receivers to tanker aircraft and integrate deconfliction efforts earlier in the ATO cycle. Through the aforementioned time analysis, this study ensured enough track time existed to support all receiver and tanker requirements. It is assumed that planners would be able to re-sequence receiver arrival times and tanker consolidation events to create a tenable schedule.

Assumptions

- All receiver demands must be met
- All schedule information provided by AMC/A9 (the non-consolidated schedule) is accurate for both receiver and tanker aircraft
- The original schedule is an accurate representation of a 24 hour cycle from an Iraq sized operation
- All KC-135 aircraft in the study are capable of fuel consolidation
- External factors such as maintenance and human factors (crew issues) are not incorporated into the study and have no impact on schedule execution
- Schedulers will be able to assign receiver aircraft new refueling times to deconflict refueling events after the consolidated schedule is built
- All tanker flight times overlap (allowing for tanker consolidation)

Input Variables Under Examination

- Fuel made available to receivers by each tanker

- Number of tankers required to meet receiver requirements
- Ratio of receiver aircraft to tanker aircraft

Output Variables Under Examination

- Number of tankers required to meet receiver requirements
- Ratio of receiver aircraft to tanker aircraft

Arena

Arena is a simulation modeling tool used for analysis of logistics, manufacturing, distribution, and supply chain systems. It is typically deployed as an enterprise business analysis and productivity tool (Arena User's Guide, 2007:1). It is a powerful tool that can graphically display system problems while providing statistical information regarding associated statistical information (Arena User's Guide, 2007:1).

This study utilized the more basic abilities of Arena, capabilities that center on modules found in its basic process panel; the *create*, *process*, *assign*, *decide*, *record*, *readwrite*, *separate*, *dispose*, and *data* modules shown in Figure 6. These modules used to reflect processes which exist within systems and are connected in a logical manner through connect lines (Arena User's Guide, 2007:11). These lines direct the flow of an entity through the simulated system. Additionally, data modules may also be accessed through the basic process panel. Data modules are used to integrate spreadsheet information into the model, and they are not graphically represented in the model window (Arena User's Guide, 2007:65). The remainder of this section details the specific actions that occur within these modules as defined by the Arena User's Guide.

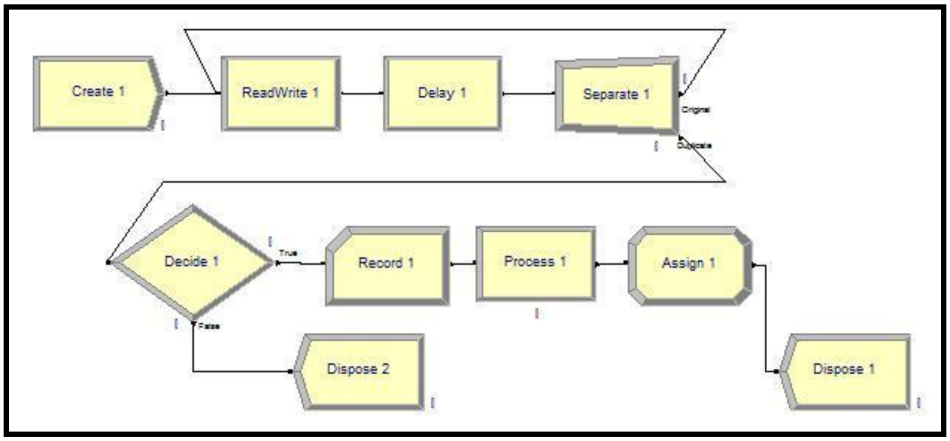


Figure 6. Arena Modules

The *create* module marks the starting point for entities in a given Arena simulation. Entities are created through the use of a schedule or, alternatively, arrive based on a user defined mathematical expression to define the time between inputs (Arena User's Guide, 2007:29). The entities depart the create module and travel along the connect lines to the next module in the Arena system.

The *process* module allows the user to simulate the delay required for an entity to cycle through a given simulation structure. The module also allows the user to seize resources required to sustain, or are that exhausted, during the process. The process can be used simultaneously by multiple entities or restricted to only one entity per cycle (Arena User's Guide 2007:31). If the resource is limited to one entity only, it is restricted (seized) for the duration of that condition and released for subsequent entities once the process is complete. If the entities overlap, a queue is generated by the module and the excess entities are cycled through the process as it becomes available.

The *assign* module is "used to assign new values to variables, entity attributes, entity types, entity pictures, or other system variables" (Arena User's Guide, 2007: 37).

The user can use additional attributes to increase the information available to Arena for analysis. Specifics such as establishing an entities priority, changing the type of an entity, or changing the value associated with an entity can all be accomplished by using the assign module (Arena User's Guide, 2007:37).

The *decide* module represents a decision event within the simulation. It includes options to make decisions based on specific conditions or programmed probabilities. "Conditions can be based on attribute values, variable values, the entity type, or an expression" (Arena User's Guide, 2007:34). This is a powerful tool as it allows the programmer to account for the probability of a specific event within the system. For example, if 30% of aircraft fail to launch due to maintenance issues, the decision module can be used to include this attrition rate in a given simulation.

Record modules are used to collect and record statistics regarding events within the simulation. This tool allows researchers to capture critical information regarding their systems; time between events, entity statistics, interval statistics, the number of entities processing through a specific module, and general observations (Arena User's Guide, 2007:38). The data collected will be made available to the researcher upon simulation completion in a report format.

Readwrite modules are used to read data from an input file or the keyboard and assign the data values to a list of variables or attributes. This module is also used to write data to an output device, such as the screen or a file. When accessing an external file (such as an Excel spreadsheet), the values of the attributes, variables, or expressions listed in the data set are read from or written to the specified Record Number (i.e., row) in the record set. The first entry is read from or written to the first field in the record, the second entity corresponds to the second field, with the process continuing until all entities are accounted for (Arena User's Guide, 2007:55-56).

Separate modules can be used to either copy an incoming entity into multiple entities or to split a previously batched entity. When splitting existing batches, the temporary representative entity that was formed is disposed and the original entities that formed the group are recovered. The entities proceed sequentially from the module in the same order in which they were originally added to the batch. When duplicating entities, the specific number of copies is made and sent from the module. The original incoming entity also leaves the module (Arena User's Guide, 2007:36).

Dispose modules are intended as the ending point for entities in a simulation model. Entity statistics may be recorded before the entity is disposed (Arena User's Guide, 2007:30)

Data modules are the set of objects in the spreadsheet view of the model that define the characteristics of various process elements, such as resources and queues. In the case of our model the data modules used are: *resource* modules, *variable* modules, and *file* modules. *Resource* modules the tanker aircraft as resources and connect them to their process modules (refueling events). *Variable* modules define the amount of fuel available to receivers from each tanker. *File* modules serve as the channel for importing external spreadsheets into Arena. In this case it allows the researcher to have receivers (entities) enter the model at a specific time with a defined fuel demand.

Simulation

Arena was structured to draw receiver fuel requirements and refueling times from an excel spreadsheet. As the simulation is started, the create module produces one entity. This entity encounters a readwrite module and creates a chain reaction that begins to draw track specific receiver information into the simulation. The information for the first receiver then passes through a delay module. The delay module delays the receiver's entry to correspond with its scheduled refueling time (sourced from the spreadsheet). The entity then enters the simulation and passes through a separate module. This module creates a copy of the receiver. The original entity is sent back to the readwrite module to trigger the entry of the next receiver, while the copy is routed to the fuel consolidation portion of the simulation. This process continues until all scheduled receivers have entered the simulation.

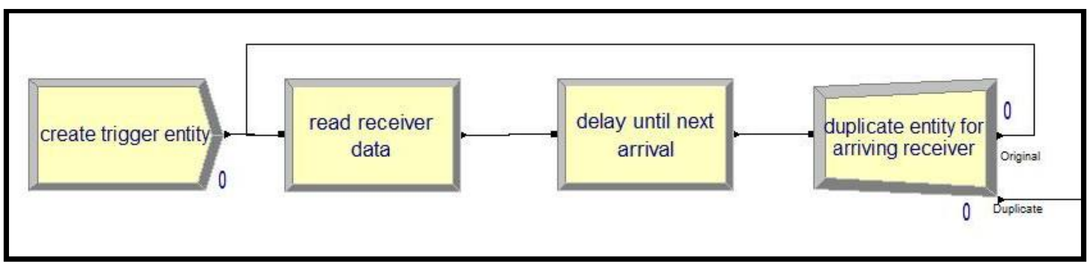


Figure 7. Receiver Entry

Each receiver copy is routed to the first scheduled tanker in the anchor. It first passes through a decision module which determines if the first scheduled tanker has enough fuel remaining to satisfy the receiver's request. If the answer is yes, the entity passes through the record module. This serves to count the number of receivers refueled by each tanker. The receiver then passes to a process module which represents the refueling event between the receiver and tanker aircraft. An assign module follows and subtracts the amount of fuel provided to the receiver aircraft from the tanker reserves. The entity then is collected in a dispose module. An entities' arrival at this module means the receiver has received its required fuel onload and is able to execute its mission as scheduled.

If the receiver arrives at the first decision module and the first tanker doesn't have enough fuel to satisfy its requirements a different sequence of events follow. The entity is routed to another decision module which determines if the first tanker has any fuel remaining at all. If the answer is yes, the receiver entity passes to an assign module which adds this remaining amount to the next tanker in the track. This is the tanker fuel consolidation event. If the answer is no, the receiver proceeds to the next decision module which determines if tanker number two has enough fuel to meet his requirements.

The process then repeats itself until all receivers have passed through the simulation. The logic contained within the consolidation assign module limits any tanker subject to a consolidation event to a maximum of 200,000 pounds of fuel. Once the consolidation event is complete, the receiver then passes through another assign module which ensures that the total available fuel on the first tanker is zero. This ensures that the first tanker is removed from the consolidation logic and all subsequent receivers will be routed around this first tanker in the future. As depicted in Figure 8, the receiver then passes to the next tanker and the process repeats itself.

If any receivers pass through the simulation without receiving their scheduled fuel onload, they collect in a dispose module labeled 'Failed Refueling'. This represents the inability of the receiver to collect its needed fuel. To determine the number of tankers required to support the refueling requirements of each track, the researcher included all tankers from the original schedule in the initial simulation run. The record modules indicated the tankers used to support receiver refueling events. Tankers with no receiver obligations were subsequently removed from the model.

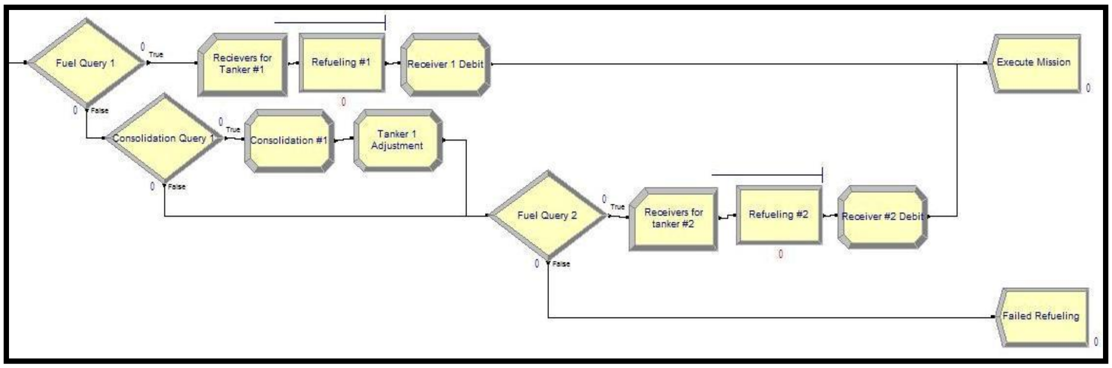


Figure 8. Fuel Consolidation Logic

Scenarios

A total of 23 different scenarios were used to analyze the impact of tanker fuel consolidation, one for each refueling track. Initialization and replication length are not included as part of the scenario. In this specific simulation, the fuel available per tanker is the only variable in flux, subsequently changing the number of tanker aircraft required to satisfy receiver requirements for the track in question. Each tanker passes any remaining fuel that is not sufficient to fill the next scheduled receiver's fuel needs to the subsequent tanker in the anchor. The tanker will only transfer fuel above its bingo fuel, ensuring its ability to return to its departure airfield. The receiving tanker will only accept fuel up to a level of 200,000 pounds. This process is deterministic; the relationship between available fuel and tankers required per track is defined by the simulation as an exact relationship and is not subject to random error (McClave, 2011:561). As the given conditions are constant, the scenarios will perform the same way regardless of the number of simulation runs. The deterministic nature of this study removes the need for multiple simulation cycles and the requirement for statistic based results analysis.

The results of this scenario were then screened for time as stated in the time analysis section of this paper. The results of the combined fuel and time screenings will determine the number of tanker aircraft required to satisfy the receiver refueling requirements for the track in question. The ratio of receiver to tanker aircraft was then determined for both the non-consolidated and the consolidated schedules. These ratios were then compared to determine the relative significance between the two results. This significance will be quantified as risk; the higher the ratio of receiver to tanker aircraft, the higher the risk.

Model Validity

The data used to construct the Arena simulations was sourced from the schedule provided by AMC/A9A. This data is assumed to be error free, and representative of the operational capabilities of all participating tanker and receiver aircraft. To support this assumption, the researcher examined a number of tanker and receiver pairings ensuring that the fuel available was sufficient to cover receiver needs both before and after the fuel consolidation simulations. In some cases, specifically tracks 9 and 17, the researcher noted that due to receiver fuel requirements, there would be no change in the number of tankers required after fuel consolidation was implemented. This expectation was confirmed as the number of required tankers remained constant after the consolidation simulation was accomplished. This contributed to the simulation's internal validity, demonstrating to the researcher that the logic and processes included in the Arena models were error free.

The researcher then examined the time requirements presented in the schedule provided by AMC/A9 to ensure that both the pre and post fuel consolidation simulations allowed sufficient time to accomplish both receiver and tanker refueling requirements. In some cases this required the addition of tankers to individual tracks, reducing the receiver to tanker ratio. This process is demonstrated in Appendix B and summarized in Appendix D.

Summary

In this chapter, the problem statement for tanker fuel consolidation was revisited. Data sourcing along with its development was explained. Additionally, simulation logic was detailed and criteria such as initialization and replication length were addressed. The next chapter will present the results and compare them with non-consolidation tanker requirements.

IV. Results and Analysis

Introduction

This chapter presents the results of the experiment. It discusses the impact of tanker fuel consolidation on the number of tankers required for each track, discusses the non-consolidated and consolidated receiver distribution schedule, and presents the receiver to tanker ratio before and after fuel consolidation.

Tanker Utilization

Simulating schedule-wide employment of fuel consolidation impacted most of the refueling tracks; most reducing the number of required tanker sorties. Using this information the researcher then analyzed the results to ensure the new receiver and tanker pairings could support the time requirements of, in many cases, increased numbers of receivers. Additionally the researcher added 30 minutes to the time required by each tanker to account for the time needed for tanker to tanker consolidation. To be clear, the first and last tankers in each anchor only required the addition of 30 extra minutes as they were subject to only one consolidation event. All other tankers were subject to two consolidation events, one as the gaining tanker and one as the losing tanker, and required the addition of 60 extra minutes.

To deconflict successive receiver arrivals and departures, 5 minutes were added to the required track time for each receiver. It should be emphasized that this makes no attempt to account for any other receiver time requirement. The original track requirements mandated by the original schedule are fully honored in the consolidated version. This ensures that all receivers have adequate time to receive any and all required fuel from the tanker in question.

Appendix B includes the combined fuel and time deconflicted schedules for all 23 refueling tracks. The tankers contained in the blue rows were added to meet excess time and fuel combinations not covered in the Arena fuel consolidation. The researcher highlighted the receiver rows in maroon to signify when receivers were added to 'blue' tankers to deconflict the schedule. The added 'blue' tankers are independent from the remainder of the schedule. They augment the remaining tankers, but do not participate in fuel consolidation.

Research Question 1

What level of efficiency can be realized through an emphasis on fuel consolidation?

After incorporating both the fuel and time constraints 183 tankers were required to satisfy receiver needs in the consolidated schedule. This is 39 less than the 222 tankers required in the non-consolidated schedule; a decrease of 17.57%. Receiver requirements (track time and fuel) are met as in the first solution, but for this schedule to be executed, planners must reassign start refueling times to meet the parameters of the consolidated schedule. In short, the tanker drives the start refueling times, not the receiver as in a current ATO. The consolidated schedule for each track can be found in Appendix B. Table 2 lists the tankers required for each track both before and after incorporating fuel consolidation.

Table 2. Tanker Requirements

Track Number	Non-Consolidated Tankers Required	Consolidated Tankers Required	Delta
1	13	11	2
2	2	1	1
3	13	10	3
4	12	9	3
5	10	8	2
6	19	17	2
7	8	7	1
8	6	5	1
9	3	3	0
10	22	16	6
11	4	2	2
12	5	3	2
13	8	7	1
14	17	16	1
15	13	11	2
16	9	9	0
17	2	2	0
18	18	17	1
19	16	13	3
20	2	1	1
21	10	8	2
22	7	5	2
23	3	2	1
Totals	222	183	39

Track Jumping

The AMC community is currently considering incorporating tanker fuel consolidation into the KC-46A Concept of Operations (CONOPS). If adopted, fuel consolidation would be scheduled into ATO tanker operations. This practice would manifest itself in one of two ways. Tankers would either 'track jump' and refuel with any available tanker in a given track regardless of altitude (as demonstrated in table 2), or restrict their consolidation events to other tankers scheduled to refuel at their same altitude (Szabo, 2010). To determine which practice harbored more efficiency potential; the researcher again analyzed the schedule provided by AMC/A9A. During this second simulation run, the ability of tankers to track jump was prohibited, and consolidation only was allowed between tankers scheduled to refuel at the same altitude. If a given altitude only hosted one tanker, consolidation was deemed not possible and that altitude was not examined. As in the aforementioned portion of this study, Arena and time analysis was applied to determine the number of tankers required to ensure all receiver fuel and time requirements were met. Table 3 shows the results of this examination.

Table 3. Efficiency Opportunities: Track Jumping vs. Altitude Restrictions

	Non-Consolidated Tanker Requirement	Consolidated Requirement Track Jumping	Consolidated Requirement No Track Jumping
Anchor 1	13	11	11
Anchor 2	2	1	1
Anchor 3	13	10	12
Anchor 4	12	9	11
Anchor 5	10	8	10
Anchor 6	19	17	17
Anchor 7	8	7	7
Anchor 8	6	5	6
Anchor 9	3	3	3
Anchor 10	22	16	17
Anchor 11	4	2	4
Anchor 12	5	3	3
Anchor 13	8	7	8
Anchor 14	17	16	17
Anchor 15	13	11	11
Anchor 16	9	9	9
Anchor 17	2	2	2
Anchor 18	18	17	17
Anchor 19	16	13	15
Anchor 20	2	1	1
Anchor 21	10	8	8
Anchor 22	7	5	6
Anchor 23	3	2	2
Totals	222	183	198
Percentage Saved	--	17.57	10.81

Efficiency possibilities were reduced by approximately seven percent when track jumping was disallowed, falling from 17.57 to 10.81 percent and requiring 15 more tanker sorties. The researcher attributes this truncated efficiency to a reduction of system flexibility. Limiting tankers to specific consolidation altitudes may prevent the establishment of potential efficiency connections. Planners should consider removing altitude limits when possible, allowing tankers to track jump and engage in fuel consolidation throughout a given anchor.

Receiver Distribution

This study quantifies risk as the number of receivers assigned to refuel with an individual tanker. As tankers are reduced through fuel consolidation, the ratio of receivers refueling with each tanker increases. This increased receiver density can be observed in the following two data sets. Table 3 lists the average receiver to tanker ratio in each track and overall average of each schedule.

Table 4. Receiver/Tanker Ratios & Track Averages

Track Number	Total Receivers in Track	Tankers Needed Without Consolidation	Non-Consolidated Receiver/Tanker Ratio	Tankers Needed With Consolidation	Consolidated Receiver/Tanker Ratio
1	39	13	3.000	11	3.545
2	2	2	1.000	1	2.000
3	61	13	4.692	10	6.100
4	37	12	3.083	9	4.111
5	45	10	4.500	8	5.625
6	68	19	3.579	17	4.000
7	20	8	2.500	7	2.857
8	19	6	3.167	5	3.800
9	4	3	1.333	3	1.333
10	73	22	3.318	16	4.563
11	9	4	2.250	2	4.500
12	5	5	1.000	3	1.667
13	18	8	2.250	7	2.571
14	58	17	3.412	16	3.625
15	43	13	3.308	11	3.909
16	32	9	3.556	9	3.556
17	4	2	2.000	2	2.000
18	66	18	3.667	17	3.882
19	50	16	3.125	13	3.846
20	2	2	1.000	1	2.000
21	36	10	3.600	8	4.500
22	29	7	4.143	5	5.800
23	4	3	1.333	2	2.000
			Category Average		Category Average
Totals	724	222	2.818	183	3.556
				Delta Between Averages	0.738

The following graphs are Pareto distributions. Pareto distributions aid in process diagnosis by highlighting the density and importance of certain process distributions (McClave 2011:788). In this specific case, it can be seen that the numbers of tankers servicing 5 receivers and above is higher in the consolidated model than in the non-consolidated model. Specifically, 22.52% (50/222) of the tankers in the non-consolidated model refuel five or more receivers compared to 42.62% (78/183) in the consolidated model. A trend line displaying a two period moving average is included to assist with data interpretation.

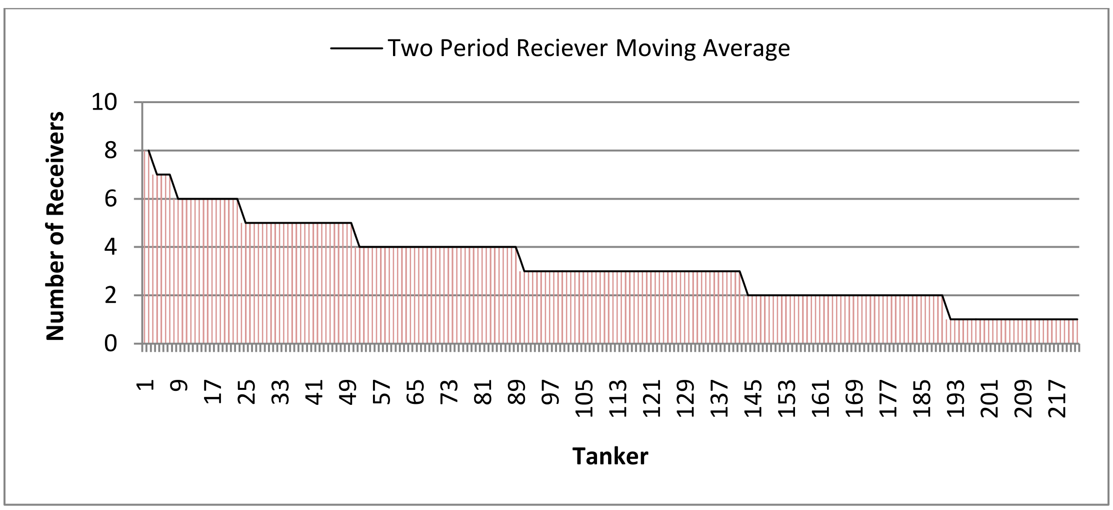


Figure 9. Non-Consolidated Receiver/Tanker Risk Assessment

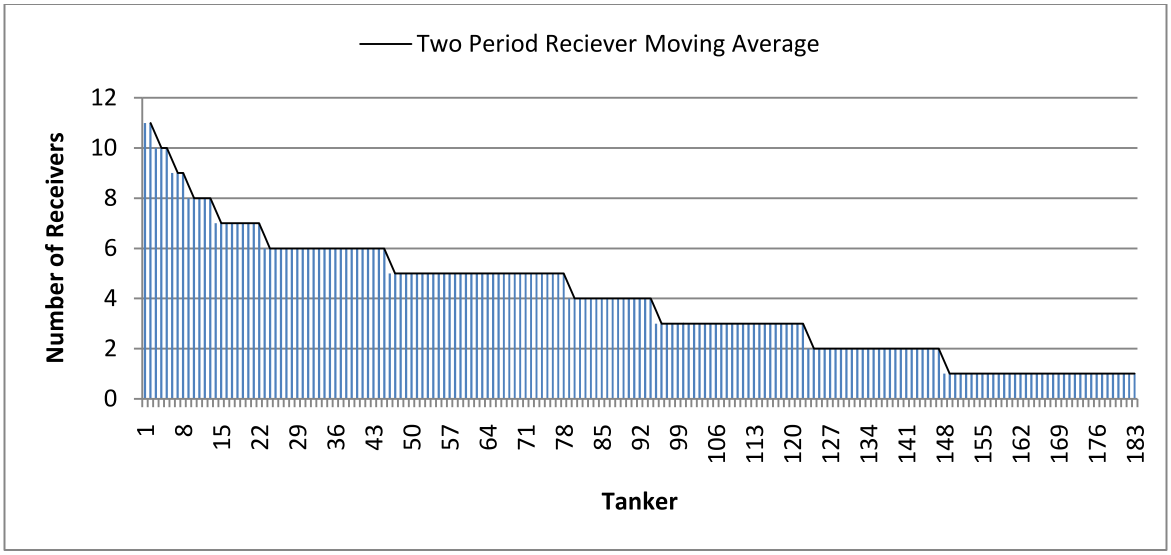


Figure 10. Consolidated Receiver/Tanker Risk Assessment

Research Question 2

How does the reduction of tanker sorties impact mission risk?

The next portion of this research focuses on the receiver impact of multiple tanker losses. This was accomplished by simulating the sequential loss of two tanker sets in each anchor; the first, second, and third tankers followed by the independent loss of the last, second to last, and third to last tankers. The average numbers of failed receiver refueling events are highlighted in Table 4. One may recall that the average ratio of receivers to tanker aircraft in a non-consolidated schedule was determined to be 2.82. This seems to agree with the conclusion that the loss of one tanker, either the first or the last, will result in 2.61 or 2.56 failed refueling events, respectively. It may be concluded, therefore, that the loss of one tanker in a consolidated schedule is comparable with the loss of one tanker in a non-consolidated schedule. That is where the parallel ends. If two tankers are lost in succession this impact more than doubles; 5.70 and 7.22 for two successive tankers. The impact is quadrupled if three consolidated tankers are lost; 10.41 and 11.47 failed refueling events respectively.

Table 5. Consolidation Risk

Anchor	Consolidated Test Condition	Rcvrs Lost		Rcvrs Lost		Rcvrs Lost	Consolidated Test Condition	Rcvrs Lost		Rcvrs Lost		Rcvrs Lost
1	Lose 1st Tkr	1	Lose 1st Two	1	Lose 1st Three	5	Lose Last Tanker	1	Lose Last Two	7	Lose Last Three	15
2	Lose 1st Tkr	2	Lose 1st Two		Lose 1st Three		Lose Last Tanker	2	Lose Last Two		Lose Last Three	
3	Lose 1st Tkr	0	Lose 1st Two	8	Lose 1st Three	17	Lose Last Tanker	2	Lose Last Two	12	Lose Last Three	13
4	Lose 1st Tkr	1	Lose 1st Two	6	Lose 1st Three	10	Lose Last Tanker	3	Lose Last Two	4	Lose Last Three	8
5	Lose 1st Tkr	11	Lose 1st Two	16	Lose 1st Three	19	Lose Last Tanker	1	Lose Last Two	11	Lose Last Three	16
6	Lose 1st Tkr	4	Lose 1st Two	7	Lose 1st Three	11	Lose Last Tanker	3	Lose Last Two	8	Lose Last Three	10
7	Lose 1st Tkr	3	Lose 1st Two	9	Lose 1st Three	13	Lose Last Tanker	2	Lose Last Two	7	Lose Last Three	13
8	Lose 1st Tkr	3	Lose 1st Two	5	Lose 1st Three	12	Lose Last Tanker	3	Lose Last Two	7	Lose Last Three	14
9	Lose 1st Tkr	2	Lose 1st Two	4	Lose 1st Three		Lose Last Tanker	2	Lose Last Two	4	Lose Last Three	
10	Lose 1st Tkr	0	Lose 1st Two	3	Lose 1st Three	7	Lose Last Tanker	1	Lose Last Two	13	Lose Last Three	19
11	Lose 1st Tkr	9	Lose 1st Two		Lose 1st Three		Lose Last Tanker	9	Lose Last Two		Lose Last Three	
12	Lose 1st Tkr	1	Lose 1st Two	3	Lose 1st Three	5	Lose Last Tanker	1	Lose Last Two	3	Lose Last Three	5
13	Lose 1st Tkr	2	Lose 1st Two	6	Lose 1st Three	12	Lose Last Tanker	1	Lose Last Two	5	Lose Last Three	10
14	Lose 1st Tkr	0	Lose 1st Two	0	Lose 1st Three	0	Lose Last Tanker	0	Lose Last Two	0	Lose Last Three	0
15	Lose 1st Tkr	0	Lose 1st Two	3	Lose 1st Three	9	Lose Last Tanker	2	Lose Last Two	11	Lose Last Three	14
16	Lose 1st Tkr	2	Lose 1st Two	7	Lose 1st Three	9	Lose Last Tanker	5	Lose Last Two	7	Lose Last Three	9
17	Lose 1st Tkr	2	Lose 1st Two	4	Lose 1st Three		Lose Last Tanker	2	Lose Last Two	4	Lose Last Three	
18	Lose 1st Tkr	2	Lose 1st Two	3	Lose 1st Three	7	Lose Last Tanker	3	Lose Last Two	9	Lose Last Three	13
19	Lose 1st Tkr	4	Lose 1st Two	11	Lose 1st Three	14	Lose Last Tanker	6	Lose Last Two	11	Lose Last Three	13
20	Lose 1st Tkr	2	Lose 1st Two		Lose 1st Three		Lose Last Tanker	2	Lose Last Two		Lose Last Three	
21	Lose 1st Tkr	3	Lose 1st Two	6	Lose 1st Three	12	Lose Last Tanker	2	Lose Last Two	3	Lose Last Three	8
22	Lose 1st Tkr	4	Lose 1st Two	8	Lose 1st Three	15	Lose Last Tanker	4	Lose Last Two	9	Lose Last Three	15
23	Lose 1st Tkr	2	Lose 1st Two	4	Lose 1st Three		Lose Last Tanker	2	Lose Last Two	4	Lose Last Three	
	Average Loss	2.61		5.7		10.41	Average Loss	2.5652		7.222		11.47

This increasing level of risk must be addressed if consolidating entire anchors within an ATO. Although it is unlikely that multiple successive tankers will be lost in a given anchor, it is possible. Leadership must balance this risk with an appropriate amount of operational to preserve schedule resiliency.

V. Conclusion and Recommendations

Rising fuel prices and an era of fiscal austerity may drive AMC leaders to seek efficiencies through tanker fuel consolidation. A KC-135R can carry a maximum of 203,290 pounds of fuel. Assuming JP-8 is the fuel variant used, this equates to 30,478 gallons of fuel. According to the Defense Logistics Agency Energy website, the FY 2011 standard price for JP-8 is $3.03 per gallon (2011). This equals a fuel savings of $92,348.34 for each individual tanker saved. This savings may be enough, when applied to prolonged campaigns, for planners to seriously begin to examine the possibilities of fuel consolidation in their ATOs. They must, however, fully understand the associated risks.

Risk

This study highlights the fact that risk increases when fuel consolidation is imposed upon the schedule. The loss of one tanker in the consolidated data set impacts more receivers than the same event imposed upon a non-consolidated schedule. It should be noted that the averages of both consolidated and non-consolidated receiver/tanker ratios differ by less than one receiver per tanker (2.81 vs. 3.55). This can be deemed as somewhat misleading as 40% of the consolidated schedule contains tankers dedicated to 5 or more receivers. This is almost double the level of risk established by the non-consolidated schedule where only 22% of tankers were paired with 5 or more receivers. The attached Pareto analysis better highlights these risks, and should be used as a tool for Air Mobility Command leaders to assess the risk associated with increasing levels of fuel consolidation.

AMC should consider incorporating fuel consolidation at a metered rate. Efforts can be focused, as in this study, on individual tracks. During the ATO building process, planners can look for tankers operating on the same track at similar times. Fuel remaining after all scheduled refueling events are complete should be examined. This should determine if enough remains to transfer to a subsequent tanker aircraft. If planners are able to schedule enough consolidation events in a given track, they may be able to eliminate a scheduled tanker. If planners are able to accomplish this just once during each ATO period, it could save a significant amount of resources over time.

Research Question 3

How should fuel consolidation be used in future conflicts?

To guard against unforeseen events, planners must incorporate a level of operational slack in their tanker consolidation practices. It is possible to build a schedule so efficient that the loss of one tanker may prevent the mission accomplishment of required receiver sorties. Currently planners use the extra fuel on the non-consolidated sorties to cover for changes in receiver demand and tanker availability. This resource currently acts as the operational slack inherent in the tanker scheduling process. Air Mobility Command planners should consider limiting consolidation, possibly forcing a given number of non-consolidated tankers with excess fuel into the scheduling process. This would provide a level of airborne operational slack that can be immediately be brought to bear should the unforeseen occur. Additionally the capabilities of the new KC-46A may allow it to be based closer to the conflict area. This flexibility should be included in a calculation of needed airborne operational slack. If the KC-46A can be based closer to, or possibly in the theater of operations, it could serve as a factor of operational slack by simply sitting alert. In the event it is needed, crews could launch and be prepared to offload fuel in a matter of minutes. This increases the resiliency of the schedule and would allow planners to use tanker fuel consolidation to eliminate a larger number of tankers from the schedule while mitigating mission risk.

Risk management and the needed level of operational slack for a given schedule are subjective. Air Mobility Command leaders must tailor the needed level of resilience based on situational requirements. Employing tanker fuel consolidation later in campaigns after threats to airborne assets are mitigated may be the best strategy. Emphasizing effectiveness early when risk is pronounced may be accomplished by building independent tanker sorties. Fuel consolidation could then be added later in the campaign to gain efficiencies. This would occur after air threats are minimized and mission accomplishment may not be as critical. This time-phased approach to consolidation may serve as the best balance between risk and efficiency. Savings will be realized while retaining the level of operational slack necessary to ensure mission success.

It is clear that the Air Force's need to base ATO creation on the need for receivers to strike time sensitive targets will not soon abate. Only extreme fiscal austerity would drive planners to time ATO execution solely on tanker availability and the efficiencies generated from fuel consolidation. Although this research effort is based on this paradigm, it does serve to highlight possible efficiency gains in individual refueling anchors. Air Mobility Command can use this understanding to seize upon opportune consolidation during the ATO cycle. As tanker planners schedule anchor requirements they routinely identify extra available fuel (see equation 1). If able, they should then schedule tanker consolidation events to preserve this fuel in the anchor. As demonstrated by this study, if enough fuel is preserved during the ATO cycle, subsequent tanker sorties may be eliminated. The concept of track jumping should always be considered. If this freedom is not associated with tanker fuel consolidation efficiencies may be limited.

Air Mobility leaders may choose to limit the number of tanker sorties eliminated through fuel consolidation to preserve the needed level of operational slack required to support the resiliency of the air campaign. These decisions are case dependent and subject to the risk tolerance of the involved commanders. The need to balance resiliency with requirements will likely grow more challenging as budgets become more limited. This study serves to highlight opportunities that may enable the Air Force to further stretch its operational dollar while meeting future mission requirements.

Appendix A. Original Anchor Schedule

Anchor 1

CALLSIGN	TYPE	TRACK ID	TIME	TIME	TANKER TRACK TIME H/MM	OFFLOAD	NUMBER	TYPE	OFFLOAD	Entry Time (M)	ARCT	AREX	TIME	FUEL ABOVE BINGO	TANKER FUEL AVAILABLE
KBIL17	K35R	ANCH01	023 01 46	023 08 32	6.77	7.1	2	A10A	7.1	166	023 02 46	023 02 56	10		
KBIL17	K35R	ANCH01	023 01 46	023 08 32	6.77	7.1	2	A10A	7.1	235	023 03 55	023 04 05	10		
KBIL17	K35R	ANCH01	023 01 46	023 08 32	6.77	7.1	2	A10A	7.1	305	023 05 05	023 05 15	10		
KBIL17	K35R	ANCH01	023 01 46	023 08 32	6.77	12.4	4	A10A	12.4	378	023 06 18	023 06 45	27		
KBIL17	K35R	ANCH01	023 01 46	023 08 32	6.77	6.2	2	A10A	6.2	465	023 07 45	023 07 55	10	8.2	48.1
KA0416	K35R	ANCH01	**023 08 03**	**023 12 13**	**4.17**	6.2	2	A10A	6.2	543	023 09 03	023 09 13	10		
KA0416	K35R	ANCH01	**023 08 03**	**023 12 13**	**4.17**	6.2	2	A10A	6.2	616	023 10 16	023 10 26	10		
KA0416	K35R	ANCH01	**023 08 03**	**023 12 13**	**4.17**	6.2	2	A10A	6.2	686	023 11 26	023 11 36	10	51.4	70
KBIL50	K35R	ANCH01	023 04 07	023 11 03	6.93	6.2	2	A10A	6.2	307	023 05 07	023 05 17	10		
KBIL50	K35R	ANCH01	023 04 07	023 11 03	6.93	6.2	2	A10A	6.2	473	023 07 53	023 08 03	10		
KBIL50	K35R	ANCH01	023 04 07	023 11 03	6.93	6.2	2	A10A	6.2	546	023 09 06	023 09 16	10		
KBIL50	K35R	ANCH01	023 04 07	023 11 03	6.93	6.2	2	A10A	6.2	616	023 10 16	023 10 26	10	21.8	46.6
KBIL02	K35R	ANCH01	023 06 46	023 11 08	4.37	7.7	2	F16C	7.7	467	023 07 47	023 07 58	11		
KBIL02	K35R	ANCH01	023 06 46	023 11 08	4.37	7.7	2	F16C	7.7	507	023 08 27	023 08 38	11		
KBIL02	K35R	ANCH01	023 06 46	023 11 08	4.37	7.7	2	F16C	7.7	547	023 09 07	023 09 18	11		
KBIL02	K35R	ANCH01	023 06 46	023 11 08	4.37	7.3	2	F16C	7.3	621	023 10 21	023 10 32	11	84.9	115.3
KA0427	K35R	ANCH01	023 10 02	023 14 25	4.38	33.8	8	F16C	33.8	663	023 11 03	023 12 26	83		
KA0427	K35R	ANCH01	023 10 02	023 14 25	4.38	9.6	2	F16C	9.6	784	023 13 04	023 13 16	12		
KA0427	K35R	ANCH01	023 10 02	023 14 25	4.38	10.4	2	F117	10.4	817	023 13 37	023 13 49	12	63.1	116.9
KA0434	K35R	ANCH01	023 10 34	023 13 12	2.63	8.5	2	F16C	8.5	695	023 11 35	023 11 47	12		
KA0434	K35R	ANCH01	023 10 34	023 13 12	2.63	8.5	2	F16C	8.5	745	023 12 25	023 12 37	12	122.9	139.9
KBIL11	K35R	ANCH01	**023 00 56**	**023 06 51**	**5.92**	10.5	2	FA22	10.5	117	023 01 57	023 02 08	11		
KBIL11	K35R	ANCH01	**023 00 56**	**023 06 51**	**5.92**	31.5	6	FA22	31.5	191	023 03 11	023 04 09	58		
KBIL11	K35R	ANCH01	**023 00 56**	**023 06 51**	**5.92**	21	4	FA22	21	286	023 04 46	023 05 22	36		
KBIL11	K35R	ANCH01	**023 00 56**	**023 06 51**	**5.92**	10.5	2	FA22	10.5	365	023 06 05	023 06 16	11	32.9	106.4
KBIL64	K35R	ANCH01	023 05 59	023 09 35	3.6	21.1	4	FA22	21.1	420	023 07 00	023 07 30	30		
KBIL64	K35R	ANCH01	023 05 59	023 09 35	3.6	35.3	8	FA22	35.3	455	023 07 35	023 08 25	50		
KBIL64	K35R	ANCH01	023 05 59	023 09 35	3.6	10.5	2	FA22	10.5	528	023 08 48	023 08 59	11	65.3	132.2
KA0431	K35R	ANCH01	023 10 11	023 13 44	3.55	17.9	4	F16C	17.9	672	023 11 12	023 11 32	20		
KA0431	K35R	ANCH01	023 10 11	023 13 44	3.55	17.9	4	F16C	17.9	720	023 12 00	023 12 20	20		
KA0431	K35R	ANCH01	023 10 11	023 13 44	3.55	17.9	4	F16C	17.9	768	023 12 48	023 13 08	20	79.3	133
KA0463	K35R	ANCH01	**023 15 37**	**023 19 28**	**3.85**	15.7	2	FA22	15.7	998	023 16 38	023 16 51	13		
KA0463	K35R	ANCH01	**023 15 37**	**023 19 28**	**3.85**	72.3	8	FA22	72.3	1051	023 17 31	023 18 52	81	41.6	129.6
KA0472	K35R	ANCH01	023 18 03	023 21 02	2.98	75.5	8	FA22	75.5	1144	023 19 04	023 20 26	82	63.6	139.1
KBIL34	K35R	ANCH01	023 16 36	023 20 39	4.05	12.9	4	F16C	12.9	1057	023 17 37	023 17 55	18		
KBIL34	K35R	ANCH01	023 16 36	023 20 39	4.05	8.2	2	F16C	8.2	1100	023 18 20	023 18 32	12		
KBIL34	K35R	ANCH01	023 16 36	023 20 39	4.05	8.2	2	F16C	8.2	1146	023 19 06	023 19 18	12		
KBIL34	K35R	ANCH01	023 16 36	023 20 39	4.05	8.2	2	F16C	8.2	1192	023 19 52	023 20 04	12	88.7	126.2
KBIL36	K35R	ANCH01	023 16 51	023 18 41	1.83	18.9	2	FA22	18.9	1072	023 17 52	023 18 06	14	133.7	152.6

Anchor 2

CALLSIGN	TYPE	TRACK ID	TIME	TIME	TANKER TRACK TIME H/MM	OFFLOAD	NUMBER	TYPE	OFFLOAD	Entry Time (M)	ARCT	AREX	TIME	FUEL ABOVE BINGO	TANKER FUEL AVAILABLE
KA0407	K35R	**ANCH02**	023 06 02	023 08 21	2.32	67.6	1	R35U	67.6	432	023 07 12	023 07 36	24	80.8	148.4
KBIL42	K35R	**ANCH02**	023 18 02	023 20 21	2.32	67.8	1	R35U	67.8	1152	023 19 12	023 19 36	24	80.6	148.4

Anchor 3

CALLSIGN	TYPE	TRACK ID	TIME	TIME	TANKER TRACK TIME H/MM	OFFLOAD	NUMBER	TYPE	OFFLOAD	Entry Time (M)	ARCT	AREX	TIME	FUEL ABOVE BINGO	TANKER FUEL AVAILABLE
KBIL21	K35R	ANCH03	023 01 59	023 08 43	6.73	9.3	2	F16C	9.3	194	023 03 14	023 03 26	12		
KBIL21	K35R	ANCH03	023 01 59	023 08 43	6.73	9.3	2	F16C	9.3	240	023 04 00	023 04 12	12		
KBIL21	K35R	ANCH03	023 01 59	023 08 43	6.73	9.3	2	F16C	9.3	286	023 04 46	023 04 58	12		
KBIL21	K35R	ANCH03	023 01 59	023 08 43	6.73	9.3	2	F16C	9.3	333	023 05 33	023 05 45	12		
KBIL21	K35R	ANCH03	023 01 59	023 08 43	6.73	9.3	2	F16C	9.3	379	023 06 19	023 06 31	12		
KBIL21	K35R	ANCH03	023 01 59	023 08 43	6.73	7.7	2	F16C	7.7	421	023 07 01	023 07 12	11		
KBIL21	K35R	ANCH03	023 01 59	023 08 43	6.73	7.7	2	F16C	7.7	461	023 07 41	023 07 52	11	26.1	88
KBIL10	K35R	ANCH03	023 07 07	023 12 34	5.45	24.3	6	F16C	24.3	502	023 08 22	023 09 13	51		
KBIL10	K35R	ANCH03	023 07 07	023 12 34	5.45	24.9	6	F16C	24.9	565	023 09 25	023 10 10	45		
KBIL10	K35R	ANCH03	023 07 07	023 12 34	5.45	32.2	8	F16C	32.2	628	023 10 28	023 11 43	75	24.8	106.2
KBIL63	K35R	ANCH03	023 05 50	023 12 20	6.50	7.3	2	F16C	7.3	425	023 07 05	023 07 16	11		
KBIL63	K35R	ANCH03	023 05 50	023 12 20	6.50	7.3	2	F16C	7.3	466	023 07 46	023 07 57	11		
KBIL63	K35R	ANCH03	023 05 50	023 12 20	6.50	7.3	2	F16C	7.3	506	023 08 26	023 08 37	11		
KBIL63	K35R	ANCH03	023 05 50	023 12 20	6.50	32	8	F16C	32	546	023 09 06	023 09 59	53		
KBIL63	K35R	ANCH03	023 05 50	023 12 20	6.50	32	8	F16C	32	606	023 10 06	023 11 00	54		
KBIL63	K35R	ANCH03	023 05 50	023 12 20	6.50	7.5	2	F16C	7.5	678	023 11 18	023 11 29	11	23.9	117.3
KBIL75	K35R	ANCH03	023 06 32	023 11 08	4.60	8.3	2	F16C	8.3	467	023 07 47	023 07 59	12		
KBIL75	K35R	ANCH03	023 06 32	023 11 08	4.60	8.3	2	F16C	8.3	510	023 08 30	023 08 42	12		
KBIL75	K35R	ANCH03	023 06 32	023 11 08	4.60	8.3	2	F16C	8.3	554	023 09 14	023 09 26	12		
KBIL75	K35R	ANCH03	023 06 32	023 11 08	4.60	15	4	F16C	15	592	023 09 52	023 10 17	25	77.4	117.3
KBIL01	K35R	ANCH03	023 06 34	023 11 17	4.72	6.8	1	F18	6.8	469	023 07 49	023 07 58	9		
KBIL01	K35R	ANCH03	023 06 34	023 11 17	4.72	27.2	4	F18	27.2	511	023 08 31	023 09 46	75		
KBIL01	K35R	ANCH03	023 06 34	023 11 17	4.72	6.8	1	F18	6.8	617	023 10 17	023 10 26	9	71	111.8
KBIL56	K35R	ANCH03	023 11 40	023 16 54	5.23	17	4	F18	17	775	023 12 55	023 13 26	31		
KBIL56	K35R	ANCH03	023 11 40	023 16 54	5.23	17	4	F18	17	824	023 13 44	023 14 16	32		
KBIL56	K35R	ANCH03	023 11 40	023 16 54	5.23	25.5	6	F18	25.5	874	023 14 34	023 15 25	51		
KBIL56	K35R	ANCH03	023 11 40	023 16 54	5.23	9.7	2	F18	9.7	951	023 15 51	023 16 03	12	39.3	108.5
KBIL24	K35R	ANCH03	023 15 26	023 19 24	3.97	9.7	2	F18	9.7	1001	023 16 41	023 16 53	12		
KBIL24	K35R	ANCH03	023 15 26	023 19 24	3.97	9.7	2	F18	9.7	1052	023 17 32	023 17 44	12		
KBIL24	K35R	ANCH03	023 15 26	023 19 24	3.97	9.7	2	F18	9.7	1102	023 18 22	023 18 34	12	93.1	122.2
KBIL67	K35R	ANCH03	023 12 19	023 15 25	3.10	8.5	2	F18	8.5	814	023 13 34	023 13 46	12		
KBIL67	K35R	ANCH03	023 12 19	023 15 25	3.10	8.5	2	F18	8.5	863	023 14 23	023 14 35	12	116.7	133.7
KBIL23	K35R	ANCH03	023 02 10	023 08 03	5.88	8.9	2	F16C	8.9	205	023 03 25	023 03 37	12		
KBIL23	K35R	ANCH03	023 02 10	023 08 03	5.88	8.9	2	F16C	8.9	250	023 04 10	023 04 22	12		
KBIL23	K35R	ANCH03	023 02 10	023 08 03	5.88	17.8	4	F16C	17.8	279	023 04 39	023 05 06	27		
KBIL23	K35R	ANCH03	023 02 10	023 08 03	5.88	15.7	2	F15A	15.7	318	023 05 18	023 05 30	12		
KBIL23	K35R	ANCH03	023 02 10	023 08 03	5.88	8.9	2	F16C	8.9	339	023 05 39	023 05 51	12		
KBIL23	K35R	ANCH03	023 02 10	023 08 03	5.88	17.8	4	F16C	17.8	368	023 06 08	023 06 35	27		
KBIL23	K35R	ANCH03	023 02 10	023 08 03	5.88	15.7	2	F15A	15.7	398	023 06 38	023 06 50	12		
KBIL23	K35R	ANCH03	023 02 10	023 08 03	5.88	8.9	2	F16C	8.9	421	023 07 01	023 07 13	12	5.5	108.1
KBIL72	K35R	ANCH03	023 06 22	023 14 30	8.13	8.9	2	F16C	8.9	457	023 07 37	023 07 49	12		
KBIL72	K35R	ANCH03	023 06 22	023 14 30	8.13	25.8	6	F16C	25.8	494	023 08 14	023 09 00	46		
KBIL72	K35R	ANCH03	023 06 22	023 14 30	8.13	15.6	2	F15A	15.6	549	023 09 09	023 09 21	12		
KBIL72	K35R	ANCH03	023 06 22	023 14 30	8.13	17.9	2	F15A	17.9	718	023 11 58	023 12 11	13		
KBIL72	K35R	ANCH03	023 06 22	023 14 30	8.13	8	2	F16C	8	739	023 12 19	023 12 31	12		
KBIL72	K35R	ANCH03	023 06 22	023 14 30	8.13	8	2	F16C	8	788	023 13 08	023 13 20	12	4.8	89
KBIL31	K35R	ANCH03	023 02 44	023 06 34	3.83	15.7	2	F15A	15.7	239	023 03 59	023 04 11	12		
KBIL31	K35R	ANCH03	023 02 44	023 06 34	3.83	8.9	2	F16C	8.9	288	023 04 48	023 05 00	12		
KBIL31	K35R	ANCH03	023 02 44	023 06 34	3.83	8.9	2	F16C	8.9	332	023 05 32	023 05 44	12	95.8	129.3
KBIL56	K35R	ANCH03	023 05 02	023 09 58	4.93	8.9	2	F16C	8.9	377	023 06 17	023 06 29	12		
KBIL56	K35R	ANCH03	023 05 02	023 09 58	4.93	15.6	2	F15A	15.6	391	023 06 31	023 06 43	12		
KBIL56	K35R	ANCH03	023 05 02	023 09 58	4.93	8.9	2	F16C	8.9	412	023 06 52	023 07 04	12		
KBIL56	K35R	ANCH03	023 05 02	023 09 58	4.93	7	2	F16C	7	453	023 07 33	023 07 44	11		
KBIL56	K35R	ANCH03	023 05 02	023 09 58	4.93	15.6	2	F15A	15.6	470	023 07 50	023 08 02	12		
KBIL56	K35R	ANCH03	023 05 02	023 09 58	4.93	7	2	F16C	7	536	023 08 56	023 09 07	11	54.8	117.8
KBIL34	K35R	ANCH03	023 02 48	023 09 49	7.02	8.9	2	F16C	8.9	243	023 04 03	023 04 15	12		
KBIL34	K35R	ANCH03	023 02 48	023 09 49	7.02	18.7	2	FA22	18.7	299	023 04 59	023 05 13	14		
KBIL34	K35R	ANCH03	023 02 48	023 09 49	7.02	8.9	2	F16C	8.9	323	023 05 23	023 05 35	12		
KBIL34	K35R	ANCH03	023 02 48	023 09 49	7.02	18.8	4	F16C	18.8	420	023 07 00	023 07 21	21		
KBIL34	K35R	ANCH03	023 02 48	023 09 49	7.02	18.8	4	F16C	18.8	470	023 07 50	023 08 11	21		
KBIL34	K35R	ANCH03	023 02 48	023 09 49	7.02	18.7	2	FA22	18.7	525	023 08 45	023 08 59	14	6.9	99.7

Anchor 4

CALLSIGN	TYPE	TRACK ID	TIME	TIME	TANKER TRACK TIME H/MM	OFFLOAD	NUMBER	TYPE	OFFLOAD	Entry Time (M)	ARCT	AREX	TIME	FUEL ABOVE BINGO	TANKER FUEL AVAILABLE
KA0446	K35R	ANCH04	023 12 18	023 18 00	5.70	8.3	2	F16C	8.3	824	023 13 44	023 13 56	12		
KA0446	K35R	ANCH04	023 12 18	023 18 00	5.70	34.2	8	F16C	34.2	873	023 14 33	023 15 43	70		
KA0446	K35R	ANCH04	023 12 18	023 18 00	5.70	8.9	2	F16C	8.9	961	023 16 01	023 16 13	12		
KA0446	K35R	ANCH04	023 12 18	023 18 00	5.70	8.9	2	F16C	8.9	1007	023 16 47	023 16 59	12	42.1	102.4
KA0473	K35R	ANCH04	023 18 39	023 23 29	4.83	19.8	2	F15E	19.8	1205	023 20 05	023 20 18	13		
KA0473	K35R	ANCH04	023 18 39	023 23 29	4.83	19.8	2	F15E	19.8	1270	023 21 10	023 21 23	13		
KA0473	K35R	ANCH04	023 18 39	023 23 29	4.83	19.8	2	F15E	19.8	1335	023 22 15	023 22 28	13	55.7	115.1
KBIL01	K35R	ANCH04	023 13 03	023 17 55	4.87	25.6	6	F16C	25.6	869	023 14 29	023 15 18	49		
KBIL01	K35R	ANCH04	023 13 03	023 17 55	4.87	9.3	2	F16C	9.3	949	023 15 49	023 16 01	12		
KBIL01	K35R	ANCH04	023 13 03	023 17 55	4.87	9	2	F16C	9	1002	023 16 42	023 16 54	12	70.2	114.1
KBIL12	K35R	ANCH04	023 14 28	023 18 05	3.62	9	2	F16C	9	954	023 15 54	023 16 06	12		
KBIL12	K35R	ANCH04	023 14 28	023 18 05	3.62	19	4	F16C	19	996	023 16 36	023 17 05	29	102	130
KBIL51	K35R	ANCH04	023 04 33	023 08 20	3.78	13.6	2	F18	13.6	359	023 05 59	023 06 13	14		
KBIL51	K35R	ANCH04	023 04 33	023 08 20	3.78	13.6	2	F18	13.6	425	023 07 05	023 07 19	14	98.9	126.1
KA0426	K35R	ANCH04	023 09 57	023 15 08	5.18	28.8	6	F16C	28.8	683	023 11 23	023 12 27	64		
KA0426	K35R	ANCH04	023 09 57	023 15 08	5.18	9.6	2	F16C	9.6	785	023 13 05	023 13 17	12		
KA0426	K35R	ANCH04	023 09 57	023 15 08	5.18	9.6	2	F16C	9.6	835	023 13 55	023 14 07	12	66.5	114.5
KBIL03	K35R	ANCH04	023 13 27	023 17 38	4.18	39.5	4	FA22	39.5	893	023 14 53	023 15 25	32		
KBIL03	K35R	ANCH04	023 13 27	023 17 38	4.18	17.9	2	F15A	17.9	929	023 15 29	023 15 42	13		
KBIL03	K35R	ANCH04	023 13 27	023 17 38	4.18	59.2	6	FA22	59.2	948	023 15 48	023 16 37	49	12.5	129.1
KBIL23	K35R	ANCH04	023 15 25	023 19 08	3.72	17.9	2	F15A	17.9	1011	023 16 51	023 17 04	13		
KBIL23	K35R	ANCH04	023 15 25	023 19 08	3.72	59.2	6	FA22	59.2	1038	023 17 18	023 18 07	49	55.5	132.6
KBIL35	K35R	ANCH04	023 16 47	023 20 22	3.58	17.9	2	F15A	17.9	1093	023 18 13	023 18 26	13		
KBIL35	K35R	ANCH04	023 16 47	023 20 22	3.58	59.1	6	FA22	59.1	1109	023 18 29	023 19 21	52	57	134
KA0435	K35R	ANCH04	023 10 34	023 15 21	4.78	38.6	4	FA22	38.6	720	023 12 00	023 12 24	24		
KA0435	K35R	ANCH04	023 10 34	023 15 21	4.78	17.9	2	F15A	17.9	847	023 14 07	023 14 20	13	65.1	121.6
KA0454	K35R	ANCH04	023 14 01	023 20 30	6.48	17	2	FA22	17	927	023 15 27	023 15 40	13		
KA0454	K35R	ANCH04	023 14 01	023 20 30	6.48	6.6	2	F16C	6.6	977	023 16 17	023 16 28	11		
KA0454	K35R	ANCH04	023 14 01	023 20 30	6.48	17	2	FA22	17	1005	023 16 45	023 16 58	13		
KA0454	K35R	ANCH04	023 14 01	023 20 30	6.48	6.6	2	F16C	6.6	1048	023 17 28	023 17 39	11		
KA0454	K35R	ANCH04	023 14 01	023 20 30	6.48	17	2	FA22	17	1083	023 18 03	023 18 16	13		
KA0454	K35R	ANCH04	023 14 01	023 20 30	6.48	15.7	2	FA22	15.7	1156	023 19 16	023 19 29	13	23.1	103
KBIL72	K35R	ANCH04	023 12 42	023 19 26	6.73	17	2	FA22	17	848	023 14 08	023 14 21	13		
KBIL72	K35R	ANCH04	023 12 42	023 19 26	6.73	19.7	2	FA22	19.7	929	023 15 29	023 15 43	14		
KBIL72	K35R	ANCH04	023 12 42	023 19 26	6.73	6.6	2	F16C	6.6	967	023 16 07	023 16 18	11		
KBIL72	K35R	ANCH04	023 12 42	023 19 26	6.73	39.4	4	FA22	39.4	1001	023 16 41	023 17 13	32		
KBIL72	K35R	ANCH04	023 12 42	023 19 26	6.73	19.7	2	FA22	19.7	1091	023 18 11	023 18 25	14	1	103.4

Anchor 5

CALLSIGN	TYPE	TRACK ID	TIME	TIME	TANKER TRACK TIME H/MM	OFFLOAD	NUMBER	TYPE	OFFLOAD	Entry Time (M)	ARCT	AREX	TIME	FUEL ABOVE BINGO	TANKER FUEL AVAILABLE
KBIL74	K35R	ANCH05	023 12 47	023 16 27	3.67	35.6	4	F15E	35.6	832	023 13 52	023 14 30	38		
KBIL74	K35R	ANCH05	023 12 47	023 16 27	3.67	53	6	F15E	53	892	023 14 52	023 15 44	52	40.5	129.1
KBIL15	K35R	ANCH05	023 14 44	023 19 39	4.92	36.5	4	F15E	36.5	949	023 15 49	023 16 24	35		
KBIL15	K35R	ANCH05	023 14 44	023 19 39	4.92	18.3	2	F15E	18.3	1012	023 16 52	023 17 05	13		
KBIL15	K35R	ANCH05	023 14 44	023 19 39	4.92	8.4	2	F16C	8.4	1041	023 17 21	023 17 33	12		
KBIL15	K35R	ANCH05	023 14 44	023 19 39	4.92	8.4	2	F16C	8.4	1082	023 18 02	023 18 14	12		
KBIL15	K35R	ANCH05	023 14 44	023 19 39	4.92	8.4	2	F16C	8.4	1124	023 18 44	023 18 56	12	32.4	112.4
KBIL75	K35R	ANCH05	023 13 02	023 18 59	5.95	54	6	F15E	54	847	023 14 07	023 15 00	53		
KBIL75	K35R	ANCH05	023 13 02	023 18 59	5.95	8.4	2	F16C	8.4	915	023 15 15	023 15 27	12		
KBIL75	K35R	ANCH05	023 13 02	023 18 59	5.95	8.4	2	F16C	8.4	957	023 15 57	023 16 09	12		
KBIL75	K35R	ANCH05	023 13 02	023 18 59	5.95	8.4	2	F16C	8.4	999	023 16 39	023 16 51	12		
KBIL75	K35R	ANCH05	023 13 02	023 18 59	5.95	7.9	2	F16C	7.9	1044	023 17 24	023 17 35	11		
KBIL75	K35R	ANCH05	023 13 02	023 18 59	5.95	7.9	2	F16C	7.9	1085	023 18 05	023 18 16	11	5.7	100.7
KBIL11	K35R	ANCH05	023 14 15	023 17 36	3.35	7.9	2	F16C	7.9	920	023 15 20	023 15 31	11		
KBIL11	K35R	ANCH05	023 14 15	023 17 36	3.35	7.9	2	F16C	7.9	962	023 16 02	023 16 13	11		
KBIL11	K35R	ANCH05	023 14 15	023 17 36	3.35	7.9	2	F16C	7.9	1003	023 16 43	023 16 54	11	107.2	130.9
KBIL66	K35R	ANCH05	023 06 12	023 11 38	5.43	10.5	2	FA22	10.5	437	023 07 17	023 07 28	11		
KBIL66	K35R	ANCH05	023 06 12	023 11 38	5.43	17.9	2	F15A	17.9	476	023 07 56	023 08 09	13		
KBIL66	K35R	ANCH05	023 06 12	023 11 38	5.43	10.5	2	FA22	10.5	511	023 08 31	023 08 42	11		
KBIL66	K35R	ANCH05	023 06 12	023 11 38	5.43	17.9	2	F15A	17.9	558	023 09 18	023 09 31	13		
KBIL66	K35R	ANCH05	023 06 12	023 11 38	5.43	7.2	2	F16C	7.2	595	023 09 55	023 10 06	11		
KBIL66	K35R	ANCH05	023 06 12	023 11 38	5.43	7.8	2	F16C	7.8	626	023 10 26	023 10 37	11		
KBIL66	K35R	ANCH05	023 06 12	023 11 38	5.43	17.9	2	F15A	17.9	640	023 10 40	023 10 53	13	22.7	112.4
KBIL40	K35R	ANCH05	023 10 10	023 15 02	4.87	7.2	2	F16C	7.2	675	023 11 15	023 11 26	11		
KBIL40	K35R	ANCH05	023 10 10	023 15 02	4.87	7.8	2	F16C	7.8	707	023 11 47	023 11 58	11		
KBIL40	K35R	ANCH05	023 10 10	023 15 02	4.87	17.9	2	F15A	17.9	722	023 12 02	023 12 15	13		
KBIL40	K35R	ANCH05	023 10 10	023 15 02	4.87	7.8	2	F16C	7.8	748	023 12 28	023 12 39	11		
KBIL40	K35R	ANCH05	023 10 10	023 15 02	4.87	17.9	2	F15A	17.9	761	023 12 41	023 12 54	13		
KBIL40	K35R	ANCH05	023 10 10	023 15 02	4.87	17.4	4	F16C	17.4	788	023 13 08	023 13 41	33		
KBIL40	K35R	ANCH05	023 10 10	023 15 02	4.87	17.9	2	F15A	17.9	843	023 14 03	023 14 16	13	24.8	118.7
KBIL06	K35R	ANCH05	023 13 37	023 17 01	3.40	17.9	2	F15A	17.9	882	023 14 42	023 14 55	13		
KBIL06	K35R	ANCH05	023 13 37	023 17 01	3.40	19.7	2	FA22	19.7	909	023 15 09	023 15 23	14		
KBIL06	K35R	ANCH05	023 13 37	023 17 01	3.40	17.9	2	F15A	17.9	964	023 16 04	023 16 17	13	79.9	135.4
KBIL20	K35R	ANCH05	023 08 52	023 12 17	3.42	17.9	2	F15A	17.9	597	023 09 57	023 10 10	13		
KBIL20	K35R	ANCH05	023 08 52	023 12 17	3.42	7.2	2	F16C	7.2	635	023 10 35	023 10 46	11		
KBIL20	K35R	ANCH05	023 08 52	023 12 17	3.42	7.8	2	F16C	7.8	666	023 11 06	023 11 17	11		
KBIL20	K35R	ANCH05	023 08 52	023 12 17	3.42	17.9	2	F15A	17.9	679	023 11 19	023 11 32	13	83.2	134
KBIL52	K35R	ANCH05	023 10 50	023 14 37	3.78	34.1	8	F16C	34.1	715	023 11 55	023 13 15	80		
KBIL52	K35R	ANCH05	023 10 50	023 14 37	3.78	39.5	4	FA22	39.5	804	023 13 24	023 13 54	30	57	130.6
KBIL22	K35R	ANCH05	023 08 55	023 14 16	5.35	7.7	2	F16C	7.7	600	023 10 00	023 10 11	11		
KBIL22	K35R	ANCH05	023 08 55	023 14 16	5.35	7.7	2	F16C	7.7	641	023 10 41	023 10 52	11		
KBIL22	K35R	ANCH05	023 08 55	023 14 16	5.35	7.7	2	F16C	7.7	681	023 11 21	023 11 32	11		
KBIL22	K35R	ANCH05	023 08 55	023 14 16	5.35	7.7	2	F16C	7.7	722	023 12 02	023 12 13	11		
KBIL22	K35R	ANCH05	023 08 55	023 14 16	5.35	9.6	2	F16C	9.6	759	023 12 39	023 12 51	12		
KBIL22	K35R	ANCH05	023 08 55	023 14 16	5.35	17.9	2	F15A	17.9	800	023 13 20	023 13 33	13	54.1	112.4

Anchor 6

CALLSIGN	TYPE	TRACK ID	TIME	TIME	TANKER TRACK TIME H/MM	OFFLOAD	NUMBER	TYPE	OFFLOAD	Entry Time (M)	ARCT	AREX	TIME	FUEL ABOVE BINGO	TANKER FUEL AVAILABLE
KBIL04	K35R	ANCH06	022 23 33	023 04 05	6.53	34.8	8	F16C	34.8	50	023 00 50	023 02 10	80		
KBIL04	K35R	ANCH06	022 23 33	023 04 05	6.53	26.1	6	F16C	26.1	136	023 02 16	023 03 11	55	56.4	117.3
KBIL22	K35R	ANCH06	023 02 07	023 05 55	3.80	17.4	4	F16C	17.4	204	023 03 24	023 03 54	30		
KBIL22	K35R	ANCH06	023 02 07	023 05 55	3.80	26.1	6	F16C	26.1	247	023 04 07	023 05 02	55	83	126.5
KBIL04	K35R	ANCH06	023 06 48	023 13 06	6.30	9.3	2	F16C	9.3	485	023 08 05	023 08 17	12		
KBIL04	K35R	ANCH06	023 06 48	023 13 06	6.30	9.3	2	F16C	9.3	531	023 08 51	023 09 03	12		
KBIL04	K35R	ANCH06	023 06 48	023 13 06	6.30	9.3	2	F16C	9.3	577	023 09 37	023 09 49	12		
KBIL04	K35R	ANCH06	023 06 48	023 13 06	6.30	9.3	2	F16C	9.3	623	023 10 23	023 10 35	12		
KBIL04	K35R	ANCH06	023 06 48	023 13 06	6.30	17.7	4	F16C	17.7	655	023 10 55	023 11 21	26		
KBIL04	K35R	ANCH06	023 06 48	023 13 06	6.30	8.4	2	F16C	8.4	700	023 11 40	023 11 52	12		
KBIL04	K35R	ANCH06	023 06 48	023 13 06	6.30	23.7	2	F15E	23.7	718	023 11 58	023 12 12	14	7.8	94.8
KBIL53	K35R	ANCH06	023 10 55	023 14 36	3.68	18.3	2	F15E	18.3	732	023 12 12	023 12 25	13		
KBIL53	K35R	ANCH06	023 10 55	023 14 36	3.68	8.4	2	F16C	8.4	744	023 12 24	023 12 36	12		
KBIL53	K35R	ANCH06	023 10 55	023 14 36	3.68	23.7	2	F15E	23.7	759	023 12 39	023 12 53	14		
KBIL53	K35R	ANCH06	023 10 55	023 14 36	3.68	53.1	6	F15E	53.1	771	023 12 51	023 13 42	51	24.7	128.2
KBIL57	K35R	ANCH06	023 11 59	023 14 23	2.40	23.7	2	F15E	23.7	796	023 13 16	023 13 30	14	121.5	145.2
KBIL05	K35R	ANCH06	022 23 35	023 05 38	6.05	9	2	F16C	9	52	023 00 52	023 01 04	12		
KBIL05	K35R	ANCH06	022 23 35	023 05 38	6.05	9	2	F16C	9	96	023 01 36	023 01 48	12		
KBIL05	K35R	ANCH06	022 23 35	023 05 38	6.05	9	2	F16C	9	140	023 02 20	023 02 32	12		
KBIL05	K35R	ANCH06	022 23 35	023 05 38	6.05	9	2	F16C	9	184	023 03 04	023 03 16	12		
KBIL05	K35R	ANCH06	022 23 35	023 05 38	6.05	9	2	F16C	9	228	023 03 48	023 04 00	12		
KBIL05	K35R	ANCH06	022 23 35	023 05 38	6.05	9	2	F16C	9	272	023 04 32	023 04 44	12	44	98
KBIL12	K35R	ANCH06	023 07 28	023 12 29	5.02	8.5	2	F16C	8.5	525	023 08 45	023 08 57	12		
KBIL12	K35R	ANCH06	023 07 28	023 12 29	5.02	8.5	2	F16C	8.5	569	023 09 29	023 09 41	12		
KBIL12	K35R	ANCH06	023 07 28	023 12 29	5.02	8.5	2	F16C	8.5	614	023 10 14	023 10 26	12		
KBIL12	K35R	ANCH06	023 07 28	023 12 29	5.02	8.5	2	F16C	8.5	658	023 10 58	023 11 10	12		
KBIL12	K35R	ANCH06	023 07 28	023 12 29	5.02	23.7	2	F15E	23.7	681	023 11 21	023 11 35	14	53.7	111.4
KBIL21	K35R	ANCH06	023 08 54	023 11 16	2.37	8.4	2	F16C	8.4	611	023 10 11	023 10 23	12	136.5	114.9
KBIL05	K35R	ANCH06	023 13 37	023 19 55	6.30	8.5	2	F18	8.5	894	023 14 54	023 15 06	12		
KBIL05	K35R	ANCH06	023 13 37	023 19 55	6.30	30.6	6	F18	30.6	981	023 16 21	023 17 22	61		
KBIL05	K35R	ANCH06	023 13 37	023 19 55	6.30	44.2	8	F18	44.2	1060	023 17 40	023 19 01	81	12	95.3
KBIL41	K35R	ANCH06	023 17 57	023 23 56	5.98	34	8	F18	34	1154	023 19 14	023 20 40	86		
KBIL41	K35R	ANCH06	023 17 57	023 23 56	5.98	8.5	2	F18	8.5	1242	023 20 42	023 20 54	12		
KBIL41	K35R	ANCH06	023 17 57	023 23 56	5.98	23.8	5	F18	23.8	1277	023 21 17	023 22 10	53		
KBIL41	K35R	ANCH06	023 17 57	023 23 56	5.98	8.5	2	F18	8.5	1370	023 22 50	023 23 02	12	23.9	98.7
KBIL20	K35R	ANCH06	023 15 05	023 19 58	4.88	8.5	2	F18	8.5	982	023 16 22	023 16 34	12		
KBIL20	K35R	ANCH06	023 15 05	023 19 58	4.88	34	8	F18	34	1055	023 17 35	023 19 04	89	69.5	112
KBIL43	K35R	ANCH06	023 18 05	023 23 06	5.02	47.6	7	F18	47.6	1162	023 19 22	023 20 43	81		
KBIL43	K35R	ANCH06	023 18 05	023 23 06	5.02	8.5	2	F18	8.5	1268	023 21 08	023 21 20	12		
KBIL43	K35R	ANCH06	023 18 05	023 23 06	5.02	8.5	2	F18	8.5	1320	023 22 00	023 22 12	12	47	111.6
KBIL21	K35R	ANCH06	023 15 17	023 22 17	7.00	6.8	1	F18	6.8	994	023 16 34	023 16 43	9		
KBIL21	K35R	ANCH06	023 15 17	023 22 17	7.00	13.6	2	F18	13.6	1045	023 17 25	023 17 39	14		
KBIL21	K35R	ANCH06	023 15 17	023 22 17	7.00	39.1	8	F18	39.1	1112	023 18 32	023 19 50	78		
KBIL21	K35R	ANCH06	023 15 17	023 22 17	7.00	17	4	F18	17	1193	023 19 53	023 20 31	38		
KBIL21	K35R	ANCH06	023 15 17	023 22 17	7.00	8.5	2	F18	8.5	1271	023 21 11	023 21 23	12	4.8	89.8
KBIL03	K35R	ANCH06	022 23 32	023 04 44	5.20	8.5	2	F16C	8.5	49	023 00 49	023 01 01	12		
KBIL03	K35R	ANCH06	022 23 32	023 04 44	5.20	8.5	2	F16C	8.5	91	023 01 31	023 01 43	12		
KBIL03	K35R	ANCH06	022 23 32	023 04 44	5.20	25.2	6	F16C	25.2	133	023 02 13	023 03 08	55		
KBIL03	K35R	ANCH06	022 23 32	023 04 44	5.20	16.7	4	F16C	16.7	190	023 03 10	023 03 50	40	55.1	114
KBIL32	K35R	ANCH06	023 02 45	023 07 00	4.25	20	2	FA22	20	242	023 04 02	023 04 16	14		
KBIL32	K35R	ANCH06	023 02 45	023 07 00	4.25	8.5	2	F16C	8.5	260	023 04 20	023 04 32	12		
KBIL32	K35R	ANCH06	023 02 45	023 07 00	4.25	8.2	2	F16C	8.2	306	023 05 06	023 05 18	12		
KBIL32	K35R	ANCH06	023 02 45	023 07 00	4.25	20	2	FA22	20	335	023 05 35	023 05 49	14		
KBIL32	K35R	ANCH06	023 02 45	023 07 00	4.25	8.2	2	F16C	8.2	355	023 05 55	023 06 07	12	60.6	125.5
KBIL60	K35R	ANCH06	023 05 12	023 09 39	4.45	38.2	8	F16C	38.2	389	023 06 29	023 07 08	39		
KBIL60	K35R	ANCH06	023 05 12	023 09 39	4.45	20	2	FA22	20	431	023 07 11	023 07 25	14		
KBIL60	K35R	ANCH06	023 05 12	023 09 39	4.45	38.2	8	F16C	38.2	486	023 08 06	023 08 45	39	29	125.4
KBIL07	K35R	ANCH06	023 00 23	023 05 31	5.13	8.2	2	F16C	8.2	100	023 01 40	023 01 52	12		
KBIL07	K35R	ANCH06	023 00 23	023 05 31	5.13	8.2	2	F16C	8.2	141	023 02 21	023 02 33	12		
KBIL07	K35R	ANCH06	023 00 23	023 05 31	5.13	8.2	2	F16C	8.2	183	023 03 03	023 03 15	12		
KBIL07	K35R	ANCH06	023 00 23	023 05 31	5.13	8.2	2	F16C	8.2	224	023 03 44	023 03 56	12		
KBIL07	K35R	ANCH06	023 00 23	023 05 31	5.13	8.2	2	F16C	8.2	265	023 04 25	023 04 37	12	73.3	114.3
KBIL46	K35R	ANCH06	023 03 57	023 08 50	4.88	8.2	2	F16C	8.2	314	023 05 14	023 05 26	12		
KBIL46	K35R	ANCH06	023 03 57	023 08 50	4.88	38.2	8	F16C	38.2	341	023 05 41	023 06 20	39		
KBIL46	K35R	ANCH06	023 03 57	023 08 50	4.88	38.2	8	F16C	38.2	438	023 07 18	023 07 57	39	35.5	120.1
KBIL13	K35R	ANCH06	023 01 08	023 05 37	4.48	20	2	FA22	20	145	023 02 25	023 02 39	14		
KBIL13	K35R	ANCH06	023 01 08	023 05 37	4.48	8.2	2	F16C	8.2	231	023 03 51	023 04 03	12		
KBIL13	K35R	ANCH06	023 01 08	023 05 37	4.48	8.2	2	F16C	8.2	272	023 04 32	023 04 44	12	86.5	122.9

Anchor 7

CALLSIGN	TYPE	TRACK ID	TIME	TIME	TANKER TRACK TIME H/MM	OFFLOAD	NUMBER	TYPE	OFFLOAD	Entry Time (M)	ARCT	AREX	TIME	FUEL ABOVE BINGO	TANKER FUEL AVAILABLE
KA0415	K35R	ANCH07	023 07 35	023 10 06	2.52	75.2	8	FA22	75.2	510	023 08 30	023 09 32	62	69.7	144.9
KA0424	K35R	ANCH07	023 09 09	023 12 12	3.05	56.4	6	FA22	56.4	604	023 10 04	023 10 50	46		
KA0424	K35R	ANCH07	023 09 09	023 12 12	3.05	37.6	4	FA22	37.6	652	023 10 52	023 11 37	45	45.6	139.6
KBIL70	K35R	ANCH07	023 12 38	023 15 50	3.20	35.9	8	F16C	35.9	813	023 13 33	023 14 10	37		
KBIL70	K35R	ANCH07	023 12 38	023 15 50	3.20	35.9	8	F16C	35.9	860	023 14 20	023 14 57	37		
KBIL70	K35R	ANCH07	023 12 38	023 15 50	3.20	18.9	2	FA22	18.9	902	023 15 02	023 15 16	14	47	137.7
KA0467	K35R	ANCH07	023 16 52	023 22 35	5.72	6.6	2	F16C	6.6	1067	023 17 47	023 17 58	11		
KA0467	K35R	ANCH07	023 16 52	023 22 35	5.72	6.6	2	F16C	6.6	1108	023 18 28	023 18 39	11		
KA0467	K35R	ANCH07	023 16 52	023 22 35	5.72	6.6	2	F16C	6.6	1148	023 19 08	023 19 19	11		
KA0467	K35R	ANCH07	023 16 52	023 22 35	5.72	32.9	8	F16C	32.9	1163	023 19 23	023 19 59	36		
KA0467	K35R	ANCH07	023 16 52	023 22 35	5.72	17	2	FA22	17	1230	023 20 30	023 20 43	13		
KA0467	K35R	ANCH07	023 16 52	023 22 35	5.72	17	2	FA22	17	1308	023 21 48	023 22 01	13	21.6	108.3
KA0422	K35R	ANCH07	023 08 38	023 12 26	3.80	37.6	4	FA22	37.6	573	023 09 33	023 10 03	30		
KA0422	K35R	ANCH07	023 08 38	023 12 26	3.80	37.6	4	FA22	37.6	667	023 11 07	023 11 52	45	56.4	131.6
KA0470	K35R	ANCH07	023 16 59	023 21 17	4.30	17	2	FA22	17	1074	023 17 54	023 18 07	13		
KA0470	K35R	ANCH07	023 16 59	023 21 17	4.30	17	2	FA22	17	1152	023 19 12	023 19 25	13		
KA0470	K35R	ANCH07	023 16 59	023 21 17	4.30	32.9	8	F16C	32.9	1207	023 20 07	023 20 43	36	58.3	125.2
KBIL26	K35R	ANCH07	023 09 09	023 10 52	1.72	18.8	2	FA22	18.8	604	023 10 04	023 10 18	14	135.3	154.1
KA0471	K35R	ANCH07	023 17 01	023 19 50	2.82	32.9	8	F16C	32.9	1076	023 17 56	023 18 32	36		
KA0471	K35R	ANCH07	023 17 01	023 19 50	2.82	32.9	8	F16C	32.9	1120	023 18 40	023 19 16	36	76.2	142

Anchor 8

CALLSIGN	TYPE	TRACK ID	TIME	TIME	TANKER TRACK TIME H/MM	OFFLOAD	NUMBER	TYPE	OFFLOAD	Entry Time (M)	ARCT	AREX	TIME	FUEL ABOVE BINGO	TANKER FUEL AVAILABLE
KA0405	K35R	ANCH08	023 05 17	023 13 18	8.02	8.2	2	F16C	8.2	372	023 06 12	023 06 24	12		
KA0405	K35R	ANCH08	023 05 17	023 13 18	8.02	8.2	2	F16C	8.2	416	023 06 56	023 07 08	12		
KA0405	K35R	ANCH08	023 05 17	023 13 18	8.02	8.2	2	F16C	8.2	459	023 07 39	023 07 51	12		
KA0405	K35R	ANCH08	023 05 17	023 13 18	8.02	8.2	2	F16C	8.2	502	023 08 22	023 08 34	12		
KA0405	K35R	ANCH08	023 05 17	023 13 18	8.02	7.3	2	F16C	7.3	631	023 10 31	023 10 42	11		
KA0405	K35R	ANCH08	023 05 17	023 13 18	8.02	7.3	2	F16C	7.3	672	023 11 12	023 11 23	11		
KA0405	K35R	ANCH08	023 05 17	023 13 18	8.02	7.3	2	F16C	7.3	712	023 11 52	023 12 03	11		
KA0405	K35R	ANCH08	023 05 17	023 13 18	8.02	7.3	2	F16C	7.3	752	023 12 32	023 12 43	11	7.5	69.5
KA0414	K35R	ANCH08	023 07 33	023 11 52	4.32	34	8	F18	34	508	023 08 28	023 09 49	81		
KA0414	K35R	ANCH08	023 07 33	023 11 52	4.32	34	8	F18	34	607	023 10 07	023 11 17	70	50.1	118.1
KA0417	K35R	ANCH08	023 08 12	023 11 03	2.85	34	8	F18	34	547	023 09 07	023 10 28	81	102.8	136.8
KA0464	K35R	ANCH08	023 16 12	023 21 38	5.43	13.9	8	F16C	13.9	1027	023 17 07	023 17 33	26		
KA0464	K35R	ANCH08	023 16 12	023 21 38	5.43	39.5	4	FA22	39.5	1129	023 18 49	023 19 34	45		
KA0464	K35R	ANCH08	023 16 12	023 21 38	5.43	59.2	6	FA22	59.2	1197	023 19 57	023 21 04	67	0.7	113.3
KA0475	K35R	ANCH08	023 20 31	024 00 31	4.00	59.2	6	FA22	59.2	1286	023 21 26	023 22 34	68		
KA0475	K35R	ANCH08	023 20 31	024 00 31	4.00	19.7	2	FA22	19.7	1376	023 22 56	023 23 10	14		
KA0475	K35R	ANCH08	023 20 31	024 00 31	4.00	19.8	2	FA22	19.8	1423	023 23 43	023 23 57	14	30.9	129.6
KBIL46	K35R	ANCH08	023 19 48	023 23 01	3.22	19.8	2	FA22	19.8	1243	023 20 43	023 20 57	14		
KBIL46	K35R	ANCH08	023 19 48	023 23 01	3.22	19.8	2	FA22	19.8	1333	023 22 13	023 22 27	14	97.7	137.3

Anchor 9

CALLSIGN	TYPE	TRACK ID	TIME	TIME	TANKER TRACK TIME H/MM	OFFLOAD	NUMBER	TYPE	OFFLOAD	Entry Time (M)	ARCT	AREX	TIME	FUEL ABOVE BINGO	TANKER FUEL AVAILABLE
KBIL02	K35R	**ANCH09**	022 23 08	023 00 49	1.68	49.8	1	E3A	49.8	0	023 00 00	023 00 20	20	105	154.8
KA0441	K35R	**ANCH09**	023 11 08	023 15 15	4.12	49.5	1	E3A	49.5	720	023 12 00	023 12 20	20		
KA0441	K35R	**ANCH09**	023 11 08	023 15 15	4.12	55.4	1	E3A	55.4	864	023 14 24	023 14 46	22	26	130.9
KA0401	K35R	**ANCH09**	023 20 44	023 22 27	1.72	55.4	1	E3A	55.4	1296	023 21 36	023 21 58	22	99.1	154.5

Anchor 10

CALLSIGN	TYPE	TRACK ID	TIME	TIME	TANKER TRACK TIME H/MM	OFFLOAD	NUMBER	TYPE	OFFLOAD	Entry Time (M)	ARCT	AREX	TIME	FUEL ABOVE BINGO	TANKER FUEL AVAILABLE
KBIL31	K35R	ANCH10	023 09 32	023 16 27	6.92	8	2	A10A	8	645	023 10 45	023 10 56	11		
KBIL31	K35R	ANCH10	023 09 32	023 16 27	6.92	8	2	A10A	8	720	023 12 00	023 12 11	11		
KBIL31	K35R	ANCH10	023 09 32	023 16 27	6.92	8	2	A10A	8	795	023 13 15	023 13 26	11		
KBIL31	K35R	ANCH10	023 09 32	023 16 27	6.92	8	2	A10A	8	864	023 14 24	023 14 35	11		
KBIL31	K35R	ANCH10	023 09 32	023 16 27	6.92	6.3	2	A10A	6.3	924	023 15 24	023 15 34	10	9.2	47.5
KBIL26	K35R	ANCH10	023 15 59	023 22 13	6.23	6.4	2	A10A	6.4	1032	023 17 12	023 17 22	10		
KBIL26	K35R	ANCH10	023 15 59	023 22 13	6.23	6.4	2	A10A	6.4	1097	023 18 17	023 18 27	10		
KBIL26	K35R	ANCH10	023 15 59	023 22 13	6.23	12.8	4	A10A	12.8	1139	023 18 59	023 19 33	34		
KBIL26	K35R	ANCH10	023 15 59	023 22 13	6.23	6.4	2	A10A	6.4	1205	023 20 05	023 20 15	10		
KBIL26	K35R	ANCH10	023 15 59	023 22 13	6.23	6.4	2	A10A	6.4	1270	023 21 10	023 21 20	10	15.1	53.5
KBIL50	K35R	ANCH10	023 10 41	023 15 22	4.68	8	2	A10A	8	714	023 11 54	023 12 05	11		
KBIL50	K35R	ANCH10	023 10 41	023 15 22	4.68	8	2	A10A	8	789	023 13 09	023 13 20	11		
KBIL50	K35R	ANCH10	023 10 41	023 15 22	4.68	6.3	2	A10A	6.3	859	023 14 19	023 14 29	10	45.2	67.5
KBIL60	K35R	ANCH10	023 12 01	023 14 16	2.25	6.3	2	A10A	6.3	794	023 13 14	023 13 24	10	84.1	90.4
KBIL35	K35R	ANCH10	023 03 05	023 08 55	5.83	37	8	F16C	37	258	023 04 18	023 05 37	79		
KBIL35	K35R	ANCH10	023 03 05	023 08 55	5.83	27.7	6	F16C	27.7	352	023 05 52	023 06 51	59		
KBIL35	K35R	ANCH10	023 03 05	023 08 55	5.83	34.3	8	F16C	34.3	419	023 06 59	023 08 02	63	2.9	101.9
KBIL06	K35R	ANCH10	023 07 03	023 11 29	4.43	16.1	4	F16C	16.1	496	023 08 16	023 08 47	31		
KBIL06	K35R	ANCH10	023 07 03	023 11 29	4.43	9	2	F16C	9	560	023 09 20	023 09 32	12		
KBIL06	K35R	ANCH10	023 07 03	023 11 29	4.43	10.4	2	F117	10.4	623	023 10 23	023 10 35	12	82.9	118.4
KBIL43	K35R	ANCH10	023 10 27	023 15 27	5.00	8.9	2	F16C	8.9	700	023 11 40	023 11 52	12		
KBIL43	K35R	ANCH10	023 10 27	023 15 27	5.00	8.9	2	F16C	8.9	748	023 12 28	023 12 40	12		
KBIL43	K35R	ANCH10	023 10 27	023 15 27	5.00	18.5	4	F16C	18.5	779	023 12 59	023 13 28	29		
KBIL43	K35R	ANCH10	023 10 27	023 15 27	5.00	18.8	4	F16C	18.8	832	023 13 52	023 14 32	40	56.6	111.7
KBIL37	K35R	ANCH10	023 03 13	023 08 55	5.70	7.1	2	F16C	7.1	266	023 04 26	023 04 37	11		
KBIL37	K35R	ANCH10	023 03 13	023 08 55	5.70	7.1	2	F16C	7.1	308	023 05 08	023 05 19	11		
KBIL37	K35R	ANCH10	023 03 13	023 08 55	5.70	7.1	2	F16C	7.1	350	023 05 50	023 06 01	11		
KBIL37	K35R	ANCH10	023 03 13	023 08 55	5.70	25.1	6	F16C	25.1	390	023 06 30	023 07 17	47		
KBIL37	K35R	ANCH10	023 03 13	023 08 55	5.70	8.9	2	F16C	8.9	469	023 07 49	023 08 01	12	47.6	102.9
KBIL61	K35R	ANCH10	023 12 02	023 15 10	3.13	8.4	2	F16C	8.4	795	023 13 15	023 13 27	12		
KBIL61	K35R	ANCH10	023 12 02	023 15 10	3.13	8.4	2	F16C	8.4	844	023 14 04	023 14 16	12	118.5	135.3
KBIL45	K35R	ANCH10	023 03 45	023 07 27	3.70	9	2	F16C	9	298	023 04 58	023 05 10	12		
KBIL45	K35R	ANCH10	023 03 45	023 07 27	3.70	9	2	F16C	9	344	023 05 44	023 05 56	12		
KBIL45	K35R	ANCH10	023 03 45	023 07 27	3.70	9	2	F16C	9	380	023 06 20	023 06 32	12	101.9	128.9
KBIL65	K35R	ANCH10	023 12 15	023 14 33	2.30	9.2	2	F16C	9.2	808	023 13 28	023 13 40	12	137	146.2
KBIL57	K35R	ANCH10	023 05 06	023 11 46	6.67	6.8	1	F18	6.8	380	023 06 20	023 06 29	9		
KBIL57	K35R	ANCH10	023 05 06	023 11 46	6.67	20.4	3	F18	20.4	446	023 07 26	023 07 55	29		
KBIL57	K35R	ANCH10	023 05 06	023 11 46	6.67	27.2	4	F18	27.2	503	023 08 23	023 08 48	25		
KBIL57	K35R	ANCH10	023 05 06	023 11 46	6.67	17	4	F18	17	623	023 10 23	023 10 54	31	19.9	91.3
KBIL37	K35R	ANCH10	023 09 59	023 16 39	6.67	17	4	F18	17	673	023 11 13	023 11 44	31		
KBIL37	K35R	ANCH10	023 09 59	023 16 39	6.67	17	4	F18	17	722	023 12 02	023 12 33	31		
KBIL37	K35R	ANCH10	023 09 59	023 16 39	6.67	8.3	2	F18	8.3	794	023 13 14	023 13 26	12		
KBIL37	K35R	ANCH10	023 09 59	023 16 39	6.67	8.3	2	F18	8.3	839	023 13 59	023 14 11	12		
KBIL37	K35R	ANCH10	023 09 59	023 16 39	6.67	21.9	4	F18	21.9	868	023 14 28	023 14 57	29		
KBIL37	K35R	ANCH10	023 09 59	023 16 39	6.67	13.6	2	F18	13.6	934	023 15 34	023 15 48	14	6.3	92.4
KBIL65	K35R	ANCH10	023 06 03	023 09 51	3.80	27.2	4	F18	27.2	437	023 07 17	023 07 42	25		
KBIL65	K35R	ANCH10	023 06 03	023 09 51	3.80	13.6	2	F18	13.6	527	023 08 47	023 09 01	14	85.8	126.6
KBIL41	K35R	ANCH10	023 10 13	023 13 50	3.62	27.2	4	F18	27.2	687	023 11 27	023 11 52	25		
KBIL41	K35R	ANCH10	023 10 13	023 13 50	3.62	27.2	4	F18	27.2	753	023 12 33	023 12 58	25	75	129.4
KBIL54	K35R	ANCH10	023 11 14	023 13 31	2.28	8.3	2	F18	8.3	748	023 12 28	023 12 40	12	136.4	144.7
KBIL25	K35R	ANCH10	023 02 20	023 06 50	4.50	18.7	2	FA22	18.7	213	023 03 33	023 03 47	14		
KBIL25	K35R	ANCH10	023 02 20	023 06 50	4.50	7.5	2	F16C	7.5	244	023 04 04	023 04 15	11		
KBIL25	K35R	ANCH10	023 02 20	023 06 50	4.50	7.5	2	F16C	7.5	291	023 04 51	023 05 02	11		
KBIL25	K35R	ANCH10	023 02 20	023 06 50	4.50	18.7	2	FA22	18.7	343	023 05 43	023 05 57	14	70.2	122.6
KBIL55	K35R	ANCH10	023 11 34	023 17 45	6.18	11.9	4	F16C	11.9	767	023 12 47	023 13 04	17		
KBIL55	K35R	ANCH10	023 11 34	023 17 45	6.18	17.5	6	F16C	17.5	810	023 13 30	023 14 02	32		
KBIL55	K35R	ANCH10	023 11 34	023 17 45	6.18	5.6	2	F16C	5.6	873	023 14 33	023 14 43	10		
KBIL55	K35R	ANCH10	023 11 34	023 17 45	6.18	25.2	6	F16C	25.2	906	023 15 06	023 15 48	42		
KBIL55	K35R	ANCH10	023 11 34	023 17 45	6.18	18.6	4	F16C	18.6	958	023 15 58	023 16 19	21		
KBIL55	K35R	ANCH10	023 11 34	023 17 45	6.18	17.9	2	F15A	17.9	999	023 16 39	023 16 52	13	9.1	105.8
KBIL25	K35R	ANCH10	023 15 45	023 21 49	6.07	19.6	6	F16C	19.6	1018	023 16 58	023 17 52	54		
KBIL25	K35R	ANCH10	023 15 45	023 21 49	6.07	17.9	2	F15A	17.9	1081	023 18 01	023 18 14	13		
KBIL25	K35R	ANCH10	023 15 45	023 21 49	6.07	19.5	6	F16C	19.5	1113	023 18 33	023 19 15	42		
KBIL25	K35R	ANCH10	023 15 45	023 21 49	6.07	17.9	2	F15A	17.9	1163	023 19 23	023 19 36	13		
KBIL25	K35R	ANCH10	023 15 45	023 21 49	6.07	17.9	2	F15A	17.9	1244	023 20 44	023 20 57	13	15	107.8

Anchor 10 Continued

CALLSIGN	TYPE	TRACK ID	TIME	TIME	TANKER TRACK TIME H/MM	OFFLOAD	NUMBER	TYPE	OFFLOAD	Entry Time (M)	ARCT	AREX	TIME	FUEL ABOVE BINGO	TANKER FUEL AVAILABLE
KBIL26	K35R	**ANCH10**	023 02 28	023 04 47	2.32	18.7	2	FA22	18.7	221	023 03 41	023 03 55	14	128.3	147
KBIL10	K35R	**ANCH10**	023 14 12	023 19 28	5.27	5.6	2	F16C	5.6	925	023 15 25	023 15 35	10		
KBIL10	K35R	**ANCH10**	023 14 12	023 19 28	5.27	5.6	2	F16C	5.6	966	023 16 06	023 16 16	10		
KBIL10	K35R	**ANCH10**	023 14 12	023 19 28	5.27	15.3	4	F16C	15.3	1008	023 16 48	023 17 15	27		
KBIL10	K35R	**ANCH10**	023 14 12	023 19 28	5.27	21.6	6	F16C	21.6	1074	023 17 54	023 18 35	41	65.2	113.3
KBIL16	K35R	**ANCH10**	023 14 57	023 18 56	3.98	38.6	4	FA22	38.6	970	023 16 10	023 16 34	24		
KBIL16	K35R	**ANCH10**	023 14 57	023 18 56	3.98	6.4	2	F16C	6.4	1017	023 16 57	023 17 08	11		
KBIL16	K35R	**ANCH10**	023 14 57	023 18 56	3.98	6.6	2	F16C	6.6	1072	023 17 52	023 18 03	11	77.9	129.5

Anchor 11

CALLSIGN	TYPE	TRACK ID	TIME	TIME	TANKER TRACK TIME H/MM	OFFLOAD	NUMBER	TYPE	OFFLOAD	Entry Time (M)	ARCT	AREX	TIME	FUEL ABOVE BINGO	TANKER FUEL AVAILABLE
KBIL13	K35R	ANCH11	023 14 30	023 17 05	2.58	19	4	F16C	19	944	023 15 44	023 16 12	28	123.2	142.2
KBIL37	K35R	ANCH11	023 17 48	023 22 33	4.75	8.3	2	F16C	8.3	1142	023 19 02	023 19 14	12		
KBIL37	K35R	ANCH11	023 17 48	023 22 33	4.75	8.3	2	F16C	8.3	1188	023 19 48	023 20 00	12		
KBIL37	K35R	ANCH11	023 17 48	023 22 33	4.75	8.3	2	F16C	8.3	1234	023 20 34	023 20 46	12		
KBIL37	K35R	ANCH11	023 17 48	023 22 33	4.75	9.5	2	F16C	9.5	1287	023 21 27	023 21 39	12	83.6	118
KBIL40	K35R	ANCH11	023 17 57	023 21 43	3.77	6.2	2	F16C	6.2	1151	023 19 11	023 19 22	11		
KBIL40	K35R	ANCH11	023 17 57	023 21 43	3.77	6.2	2	F16C	6.2	1194	023 19 54	023 20 05	11		
KBIL40	K35R	ANCH11	023 17 57	023 21 43	3.77	9.5	2	F16C	9.5	1237	023 20 37	023 20 49	12	106.8	128.7
KBIL44	K35R	ANCH11	023 18 33	023 20 52	2.32	9.5	2	F16C	9.5	1187	023 19 47	023 19 59	12	136.9	146.4

Anchor 12

CALLSIGN	TYPE	TRACK ID	TIME	TIME	TANKER TRACK TIME H/MM	OFFLOAD	NUMBER	TYPE	OFFLOAD	Entry Time (M)	ARCT	AREX	TIME	FUEL ABOVE BINGO	TANKER FUEL AVAILABLE
KBIL43	K35R	ANCH12	023 03 36	023 06 04	2.47	81.6	1	E8C	81.6	288	023 04 48	023 05 15	27	65.5	147.1
KA0420	K35R	ANCH12	023 08 24	023 10 46	2.37	53.6	1	R35U	53.6	576	023 09 36	023 09 57	21	94	147.6
KA0452	K35R	ANCH12	023 12 53	023 15 17	2.40	63.5	1	E4B	63.5	845	023 14 05	023 14 28	23	83.9	147.4
KA0462	K35R	ANCH12	023 15 36	023 18 04	2.47	81.6	1	E8C	81.6	1008	023 16 48	023 17 15	27	65.5	147.1
KA0474	K35R	ANCH12	023 20 24	023 22 46	2.37	53.6	1	R35U	53.6	1296	023 21 36	023 21 57	21	94	147.6

Anchor 13

CALLSIGN	TYPE	TRACK ID	TIME	TIME	TANKER TRACK TIME H/MM	OFFLOAD	NUMBER	TYPE	OFFLOAD	Entry Time (M)	ARCT	AREX	TIME	FUEL ABOVE BINGO	TANKER FUEL AVAILABLE
KBIL31	K35R	ANCH13	023 16 07	023 17 54	1.78	3.5	2	F117	3.5	1027	023 17 07	023 17 16	9	147.2	150.7
KA0410	K35R	ANCH13	023 06 26	023 08 57	2.52	25.5	6	F18	25.5	447	023 07 27	023 08 20	53	115.5	141
KA0466	K35R	ANCH13	023 16 34	023 19 53	3.32	8.5	2	F18	8.5	1055	023 17 35	023 17 47	12		
KA0466	K35R	ANCH13	023 16 34	023 19 53	3.32	22.1	4	F18	22.1	1117	023 18 37	023 19 15	38	99.8	130.4
KA0442	K35R	ANCH13	023 11 28	023 15 50	4.37	31.6	8	F16C	31.6	748	023 12 28	023 13 48	80		
KA0442	K35R	ANCH13	023 11 28	023 15 50	4.37	31.6	8	F16C	31.6	833	023 13 53	023 15 12	79	59.7	122.9
KA0457	K35R	ANCH13	023 14 28	023 17 48	3.33	7.9	2	F16C	7.9	928	023 15 28	023 15 39	11		
KA0457	K35R	ANCH13	023 14 28	023 17 48	3.33	35.9	8	F16C	35.9	952	023 15 52	023 16 29	37		
KA0457	K35R	ANCH13	023 14 28	023 17 48	3.33	9.2	2	F16C	9.2	1018	023 16 58	023 17 10	12	81.4	134.4
KA0447	K35R	ANCH13	023 12 21	023 17 21	5.00	7.9	2	F16C	7.9	801	023 13 21	023 13 32	11		
KA0447	K35R	ANCH13	023 12 21	023 17 21	5.00	18.8	2	FA22	18.8	820	023 13 40	023 13 54	14		
KA0447	K35R	ANCH13	023 12 21	023 17 21	5.00	23.7	6	F16C	23.7	843	023 14 03	023 14 57	54		
KA0447	K35R	ANCH13	023 12 21	023 17 21	5.00	35.9	8	F16C	35.9	906	023 15 06	023 15 43	37		
KA0447	K35R	ANCH13	023 12 21	023 17 21	5.00	26.3	6	F16C	26.3	956	023 15 56	023 16 42	46	6.4	119
KA0450	K35R	ANCH13	023 12 24	023 14 16	1.87	18.9	2	FA22	18.9	804	023 13 24	023 13 38	14	133.3	152.2
KA0451	K35R	ANCH13	023 12 48	023 16 55	4.12	17.1	4	F16C	17.1	828	023 13 48	023 14 21	33		
KA0451	K35R	ANCH13	023 12 48	023 16 55	4.12	56.6	6	FA22	56.6	868	023 14 28	023 15 28	60		
KA0451	K35R	ANCH13	023 12 48	023 16 55	4.12	56.7	6	FA22	56.7	930	023 15 30	023 16 16	46	49.2	179.6

Anchor 14

CALLSIGN	TYPE	TRACK ID	TIME	TIME	TANKER TRACK TIME H/MM	OFFLOAD	NUMBER	TYPE	OFFLOAD	Entry Time (M)	ARCT	AREX	TIME	FUEL ABOVE BINGO	TANKER FUEL AVAILABLE
KBIL12	K35R	ANCH14	023 01 05	023 04 56	3.85	22.9	2	F15E	22.9	132	023 02 12	023 02 26	14		
KBIL12	K35R	ANCH14	023 01 05	023 04 56	3.85	44.3	4	F15E	44.3	208	023 03 28	023 04 11	43	59.5	126.7
KBIL42	K35R	ANCH14	023 03 36	023 07 59	4.38	44.3	4	F15E	44.3	283	023 04 43	023 05 19	36		
KBIL42	K35R	ANCH14	023 03 36	023 07 59	4.38	7.4	2	F16C	7.4	342	023 05 42	023 05 53	11		
KBIL42	K35R	ANCH14	023 03 36	023 07 59	4.38	44.1	4	F15E	44.1	373	023 06 13	023 06 49	36		
KBIL42	K35R	ANCH14	023 03 36	023 07 59	4.38	7.4	2	F16C	7.4	423	023 07 03	023 07 14	11	16.7	119.9
KBIL70	K35R	ANCH14	023 06 15	023 10 28	4.22	22.7	2	F15E	22.7	442	023 07 22	023 07 36	14		
KBIL70	K35R	ANCH14	023 06 15	023 10 28	4.22	7.4	2	F16C	7.4	464	023 07 44	023 07 55	11		
KBIL70	K35R	ANCH14	023 06 15	023 10 28	4.22	65.2	6	F15E	65.2	487	023 08 07	023 09 03	56		
KBIL70	K35R	ANCH14	023 06 15	023 10 28	4.22	22.7	2	F15E	22.7	569	023 09 29	023 09 43	14	5.1	123.1
KBIL24	K35R	ANCH14	023 09 02	023 13 52	4.83	41.8	4	F15E	41.8	609	023 10 09	023 10 48	39		
KBIL24	K35R	ANCH14	023 09 02	023 13 52	4.83	22	2	F15E	22	683	023 11 23	023 11 37	14		
KBIL24	K35R	ANCH14	023 09 02	023 13 52	4.83	5.7	2	F16C	5.7	727	023 12 07	023 12 17	10		
KBIL24	K35R	ANCH14	023 09 02	023 13 52	4.83	40.1	8	F117	40.1	750	023 12 30	023 13 07	37	5.3	114.9
KBIL24	K35R	ANCH14	023 02 20	023 07 51	5.52	22.9	2	F15E	22.9	207	023 03 27	023 03 41	14		
KBIL24	K35R	ANCH14	023 02 20	023 07 51	5.52	22.7	2	F15E	22.7	319	023 05 19	023 05 33	14		
KBIL24	K35R	ANCH14	023 02 20	023 07 51	5.52	22.7	2	F15E	22.7	367	023 06 07	023 06 21	14		
KBIL24	K35R	ANCH14	023 02 20	023 07 51	5.52	7.4	2	F16C	7.4	383	023 06 23	023 06 34	11		
KBIL24	K35R	ANCH14	023 02 20	023 07 51	5.52	22.7	2	F15E	22.7	411	023 06 51	023 07 05	14	9.5	107.9
KBIL73	K35R	ANCH14	023 06 26	023 12 21	5.92	22.7	2	F15E	22.7	453	023 07 33	023 07 47	14		
KBIL73	K35R	ANCH14	023 06 26	023 12 21	5.92	22.7	2	F15E	22.7	493	023 08 13	023 08 27	14		
KBIL73	K35R	ANCH14	023 06 26	023 12 21	5.92	19.8	2	F15E	19.8	570	023 09 30	023 09 43	13		
KBIL73	K35R	ANCH14	023 06 26	023 12 21	5.92	22	2	F15E	22	646	023 10 46	023 11 00	14		
KBIL73	K35R	ANCH14	023 06 26	023 12 21	5.92	5.7	2	F16C	5.7	685	023 11 25	023 11 35	10	10.5	103.4
KBIL62	K35R	ANCH14	023 05 46	023 13 01	7.25	7.8	2	F117	7.8	413	023 06 53	023 07 04	11		
KBIL62	K35R	ANCH14	023 05 46	023 13 01	7.25	22	2	F15E	22	571	023 09 31	023 09 45	14		
KBIL62	K35R	ANCH14	023 05 46	023 13 01	7.25	40.1	8	F117	40.1	690	023 11 30	023 12 07	37	18.6	88.5
KBIL33	K35R	ANCH14	023 02 47	023 04 53	2.10	13.6	2	F18	13.6	235	023 03 55	023 04 09	14	133.4	147
KBIL15	K35R	ANCH14	023 08 37	023 13 33	4.93	17	4	F18	17	585	023 09 45	023 10 16	31		
KBIL15	K35R	ANCH14	023 08 37	023 13 33	4.93	17	4	F18	17	635	023 10 35	023 11 06	31		
KBIL15	K35R	ANCH14	023 08 37	023 13 33	4.93	34.1	8	F18	34.1	684	023 11 24	023 12 24	60		
KBIL15	K35R	ANCH14	023 08 37	023 13 33	4.93	8.5	2	F18	8.5	756	023 12 36	023 12 48	12	35.3	111.9
KBIL62	K35R	ANCH14	023 12 09	023 17 09	5.00	27.2	4	F18	27.2	797	023 13 17	023 13 49	32		
KBIL62	K35R	ANCH14	023 12 09	023 17 09	5.00	49.3	8	F18	49.3	850	023 14 10	023 15 15	65		
KBIL62	K35R	ANCH14	023 12 09	023 17 09	5.00	17.1	4	F18	17.1	932	023 15 32	023 15 52	20		
KBIL62	K35R	ANCH14	023 12 09	023 17 09	5.00	8.5	2	F18	8.5	973	023 16 13	023 16 25	12	10.3	112.4
KBIL27	K35R	ANCH14	023 09 21	023 14 13	4.87	20.4	3	F18	20.4	629	023 10 29	023 10 57	28		
KBIL27	K35R	ANCH14	023 09 21	023 14 13	4.87	27.2	4	F18	27.2	709	023 11 49	023 12 25	36		
KBIL27	K35R	ANCH14	023 09 21	023 14 13	4.87	40.8	6	F18	40.8	763	023 12 43	023 13 29	46	26.1	114.5
KBIL73	K35R	ANCH14	023 12 45	023 16 49	4.07	23.9	5	F18	23.9	833	023 13 53	023 14 32	39		
KBIL73	K35R	ANCH14	023 12 45	023 16 49	4.07	17.1	4	F18	17.1	883	023 14 43	023 15 03	20		
KBIL73	K35R	ANCH14	023 12 45	023 16 49	4.07	6.8	1	F18	6.8	929	023 15 29	023 15 38	9		
KBIL73	K35R	ANCH14	023 12 45	023 16 49	4.07	8.5	2	F18	8.5	952	023 15 52	023 16 04	12	65.9	122.2
KBIL63	K35R	ANCH14	023 12 12	023 16 20	4.13	15.8	4	F18	15.8	800	023 13 20	023 13 39	19		
KBIL63	K35R	ANCH14	023 12 12	023 16 20	4.13	17	4	F18	17	853	023 14 13	023 14 46	33		
KBIL63	K35R	ANCH14	023 12 12	023 16 20	4.13	8.5	2	F18	8.5	923	023 15 23	023 15 35	12	81.2	122.5
KBIL52	K35R	ANCH14	023 04 46	023 09 06	4.33	8.9	2	F16C	8.9	353	023 05 53	023 06 05	12		
KBIL52	K35R	ANCH14	023 04 46	023 09 06	4.33	26.7	6	F16C	26.7	384	023 06 24	023 07 07	43		
KBIL52	K35R	ANCH14	023 04 46	023 09 06	4.33	17.8	4	F16C	17.8	432	023 07 12	023 07 40	28		
KBIL52	K35R	ANCH14	023 04 46	023 09 06	4.33	37.3	8	F16C	37.3	463	023 07 43	023 08 21	38	34.2	124.9
KBIL11	K35R	ANCH14	023 07 23	023 10 17	2.90	37.3	8	F16C	37.3	510	023 08 30	023 09 08	38		
KBIL11	K35R	ANCH14	023 07 23	023 10 17	2.90	16	4	F16C	16	553	023 09 13	023 09 32	19	87.3	140.6
KBIL54	K35R	ANCH14	023 05 01	023 09 56	4.92	37.3	8	F16C	37.3	368	023 06 08	023 06 46	38		
KBIL54	K35R	ANCH14	023 05 01	023 09 56	4.92	37.3	8	F16C	37.3	415	023 06 55	023 07 33	38		
KBIL54	K35R	ANCH14	023 05 01	023 09 56	4.92	17.8	4	F16C	17.8	463	023 07 43	023 08 12	29		
KBIL54	K35R	ANCH14	023 05 01	023 09 56	4.92	17.4	4	F16C	17.4	510	023 08 30	023 09 11	41	11.5	121.3
KBIL71	K35R	ANCH14	023 06 18	023 09 32	3.23	24.5	6	F16C	24.5	445	023 07 25	023 08 02	37		
KBIL71	K35R	ANCH14	023 06 18	023 09 32	3.23	24.5	6	F16C	24.5	492	023 08 12	023 08 47	35	88	137

Anchor 15

CALLSIGN	TYPE	TRACK ID	TIME	TIME	TANKER TRACK TIME H/MM	OFFLOAD	NUMBER	TYPE	OFFLOAD	Entry Time (M)	ARCT	AREX	TIME	FUEL ABOVE BINGO	TANKER FUEL AVAILABLE
KBIL22	K35R	**ANCH15**	023 15 20	023 22 46	7.43	8.5	2	F16C	8.5	988	023 16 28	023 16 40	12		
KBIL22	K35R	**ANCH15**	023 15 20	023 22 46	7.43	8.5	2	F16C	8.5	1032	023 17 12	023 17 24	12		
KBIL22	K35R	**ANCH15**	023 15 20	023 22 46	7.43	8.5	2	F16C	8.5	1077	023 17 57	023 18 09	12		
KBIL22	K35R	**ANCH15**	023 15 20	023 22 46	7.43	8.5	2	F16C	8.5	1121	023 18 41	023 18 53	12		
KBIL22	K35R	**ANCH15**	023 15 20	023 22 46	7.43	9.4	2	F16C	9.4	1208	023 20 08	023 20 20	12		
KBIL22	K35R	**ANCH15**	023 15 20	023 22 46	7.43	9.4	2	F16C	9.4	1257	023 20 57	023 21 09	12		
KBIL22	K35R	**ANCH15**	023 15 20	023 22 46	7.43	9.4	2	F16C	9.4	1307	023 21 47	023 21 59	12	15.8	78
KBIL27	K35R	**ANCH15**	023 02 29	023 09 08	6.65	6.8	1	F18	6.8	217	023 03 37	023 03 46	9		
KBIL27	K35R	**ANCH15**	023 02 29	023 09 08	6.65	6.8	1	F18	6.8	283	023 04 43	023 04 52	9		
KBIL27	K35R	**ANCH15**	023 02 29	023 09 08	6.65	13.6	2	F18	13.6	332	023 05 32	023 05 53	21		
KBIL27	K35R	**ANCH15**	023 02 29	023 09 08	6.65	6.8	1	F18	6.8	398	023 06 38	023 06 47	9		
KBIL27	K35R	**ANCH15**	023 02 29	023 09 08	6.65	6.8	1	F18	6.8	426	023 07 06	023 07 15	9		
KBIL27	K35R	**ANCH15**	023 02 29	023 09 08	6.65	6.8	1	F18	6.8	492	023 08 12	023 08 21	9	37.5	85.1
KBIL36	K35R	**ANCH15**	023 09 53	023 15 14	5.35	17	4	F18	17	661	023 11 01	023 11 32	31		
KBIL36	K35R	**ANCH15**	023 09 53	023 15 14	5.35	17	4	F18	17	711	023 11 51	023 12 21	30		
KBIL36	K35R	**ANCH15**	023 09 53	023 15 14	5.35	25.6	6	F18	25.6	760	023 12 40	023 13 30	50		
KBIL36	K35R	**ANCH15**	023 09 53	023 15 14	5.35	25.5	6	F18	25.5	817	023 13 37	023 14 27	50	22.4	107.5
KBIL04	K35R	**ANCH15**	023 13 35	023 17 50	4.25	22.6	5	F18	22.6	883	023 14 43	023 15 14	31		
KBIL04	K35R	**ANCH15**	023 13 35	023 17 50	4.25	34	5	F18	34	937	023 15 37	023 16 20	43		
KBIL04	K35R	**ANCH15**	023 13 35	023 17 50	4.25	6.8	1	F18	6.8	1014	023 16 54	023 17 03	9	56.2	119.6
KBIL41	K35R	**ANCH15**	023 03 30	023 05 34	2.07	6.8	1	F18	6.8	278	023 04 38	023 04 47	9	139.5	146.3
KBIL45	K35R	**ANCH15**	023 10 31	023 14 50	4.32	25.5	6	F18	25.5	699	023 11 39	023 12 40	61		
KBIL45	K35R	**ANCH15**	023 10 31	023 14 50	4.32	35.7	6	F18	35.7	778	023 12 58	023 14 03	65	58.4	119.6
KBIL14	K35R	**ANCH15**	023 14 40	023 17 49	3.15	6.8	1	F18	6.8	948	023 15 48	023 15 57	9		
KBIL14	K35R	**ANCH15**	023 14 40	023 17 49	3.15	31.9	8	F18	31.9	970	023 16 10	023 17 01	51	94.2	132.9
KA0437	K35R	**ANCH15**	023 10 44	023 14 06	3.37	22.1	4	F18	22.1	712	023 11 52	023 12 29	37		
KA0437	K35R	**ANCH15**	023 10 44	023 14 06	3.37	17	4	F18	17	767	023 12 47	023 13 18	31	92.9	132
KBIL55	K35R	**ANCH15**	023 05 01	023 07 52	2.85	6.9	2	F16C	6.9	369	023 06 09	023 06 20	11		
KBIL55	K35R	**ANCH15**	023 05 01	023 07 52	2.85	6.9	2	F16C	6.9	414	023 06 54	023 07 05	11	125.1	138.9
KBIL03	K35R	**ANCH15**	023 06 46	023 12 08	5.37	25.5	6	F16C	25.5	474	023 07 54	023 08 52	58		
KBIL03	K35R	**ANCH15**	023 06 46	023 12 08	5.37	25.5	6	F16C	25.5	548	023 09 08	023 10 07	59		
KBIL03	K35R	**ANCH15**	023 06 46	023 12 08	5.37	37.3	8	F16C	37.3	643	023 10 43	023 11 21	38	25.5	113.8
KBIL42	K35R	**ANCH15**	023 10 22	023 14 25	4.05	37.3	8	F16C	37.3	690	023 11 30	023 12 08	38		
KBIL42	K35R	**ANCH15**	023 10 22	023 14 25	4.05	37.3	8	F16C	37.3	738	023 12 18	023 12 56	38		
KBIL42	K35R	**ANCH15**	023 10 22	023 14 25	4.05	26.8	6	F16C	26.8	789	023 13 09	023 13 38	29	28	129.4
KBIL17	K35R	**ANCH15**	023 08 47	023 13 41	4.90	37.3	8	F16C	37.3	595	023 09 55	023 10 33	38		
KBIL17	K35R	**ANCH15**	023 08 47	023 13 41	4.90	18.8	2	FA22	18.8	635	023 10 35	023 10 49	14		
KBIL17	K35R	**ANCH15**	023 08 47	023 13 41	4.90	16	4	F16C	16	651	023 10 51	023 11 10	19		
KBIL17	K35R	**ANCH15**	023 08 47	023 13 41	4.90	16	4	F16C	16	696	023 11 36	023 11 55	19		
KBIL17	K35R	**ANCH15**	023 08 47	023 13 41	4.90	26.8	6	F16C	26.8	743	023 12 23	023 12 52	29	7.2	122.1
KA0423	K35R	**ANCH15**	023 08 58	023 12 53	3.92	24.1	6	F16C	24.1	606	023 10 06	023 10 43	37		
KA0423	K35R	**ANCH15**	023 08 58	023 12 53	3.92	26.8	6	F16C	26.8	651	023 10 51	023 11 20	29		
KA0423	K35R	**ANCH15**	023 08 58	023 12 53	3.92	26.8	6	F16C	26.8	697	023 11 37	023 12 06	29	53	130.7

Anchor 16

CALLSIGN	TYPE	TRACK ID	TIME	TIME	TANKER TRACK TIME H/MM	OFFLOAD	NUMBER	TYPE	OFFLOAD	Entry Time (M)	ARCT	AREX	TIME	FUEL ABOVE BINGO	TANKER FUEL AVAILABLE
KA0443	K35R	ANCH16	023 12 10	023 21 22	9.20	3.7	2	F16C	3.7	791	023 13 11	023 13 20	9		
KA0443	K35R	ANCH16	023 12 10	023 21 22	9.20	3.2	2	F16C	3.2	863	023 14 23	023 14 32	9		
KA0443	K35R	ANCH16	023 12 10	023 21 22	9.20	2.5	2	F16C	2.5	1037	023 17 17	023 17 26	9		
KA0443	K35R	ANCH16	023 12 10	023 21 22	9.20	9.9	8	F16C	9.9	1073	023 17 53	023 19 01	68		
KA0443	K35R	ANCH16	023 12 10	023 21 22	9.20	8.8	6	F16C	8.8	1154	023 19 14	023 20 10	56	31.1	59.2
KBIL40	K35R	ANCH16	023 03 16	023 08 35	5.32	8.5	2	F18	8.5	258	023 04 18	023 04 30	12		
KBIL40	K35R	ANCH16	023 03 16	023 08 35	5.32	8.5	2	F18	8.5	308	023 05 08	023 05 20	12		
KBIL40	K35R	ANCH16	023 03 16	023 08 35	5.32	44.6	8	F18	44.6	380	023 06 20	023 07 24	64		
KBIL40	K35R	ANCH16	023 03 16	023 08 35	5.32	27.2	4	F18	27.2	446	023 07 26	023 07 51	25	18.1	106.9
KA0412	K35R	ANCH16	023 06 59	023 11 10	4.18	34	8	F18	34	481	023 08 01	023 09 18	77		
KA0412	K35R	ANCH16	023 06 59	023 11 10	4.18	34.1	8	F18	34.1	566	023 09 26	023 10 27	61	52.3	120.4
KBIL61	K35R	ANCH16	023 05 20	023 10 29	5.15	17	4	F18	17	382	023 06 22	023 06 56	34		
KBIL61	K35R	ANCH16	023 05 20	023 10 29	5.15	17.1	4	F18	17.1	439	023 07 19	023 07 39	20		
KBIL61	K35R	ANCH16	023 05 20	023 10 29	5.15	25.6	6	F18	25.6	475	023 07 55	023 08 29	34		
KBIL61	K35R	ANCH16	023 05 20	023 10 29	5.15	22.1	4	F18	22.1	517	023 08 37	023 09 09	32		
KBIL61	K35R	ANCH16	023 05 20	023 10 29	5.15	13.6	2	F18	13.6	572	023 09 32	023 09 46	14	16.4	111.8
KA0406	K35R	ANCH16	023 05 28	023 10 20	4.87	17.1	4	F18	17.1	390	023 06 30	023 06 50	20		
KA0406	K35R	ANCH16	023 05 28	023 10 20	4.87	17	4	F18	17	426	023 07 06	023 07 46	40		
KA0406	K35R	ANCH16	023 05 28	023 10 20	4.87	17	4	F18	17	496	023 08 16	023 08 49	33		
KA0406	K35R	ANCH16	023 05 28	023 10 20	4.87	17.1	4	F18	17.1	557	023 09 17	023 09 37	20	46.7	114.9
KA0430	K35R	ANCH16	023 10 08	023 13 53	3.75	33.4	8	F16C	33.4	669	023 11 09	023 11 45	36		
KA0430	K35R	ANCH16	023 10 08	023 13 53	3.75	33.4	8	F16C	33.4	711	023 11 51	023 12 27	36		
KA0430	K35R	ANCH16	023 10 08	023 13 53	3.75	33.4	8	F16C	33.4	753	023 12 33	023 13 09	36	32.2	132.4
KA0444	K35R	ANCH16	023 12 13	023 15 58	3.75	33.4	8	F16C	33.4	794	023 13 14	023 13 50	36		
KA0444	K35R	ANCH16	023 12 13	023 15 58	3.75	33.4	8	F16C	33.4	836	023 13 56	023 14 32	36		
KA0444	K35R	ANCH16	023 12 13	023 15 58	3.75	33.4	8	F16C	33.4	878	023 14 38	023 15 14	36	32.2	132.4
KA0432	K35R	ANCH16	023 10 20	023 15 36	5.27	38.6	4	FA22	38.6	681	023 11 21	023 11 53	32		
KA0432	K35R	ANCH16	023 10 20	023 15 36	5.27	37.7	4	FA22	37.7	774	023 12 54	023 13 24	30		
KA0432	K35R	ANCH16	023 10 20	023 15 36	5.27	19.8	2	FA22	19.8	879	023 14 39	023 14 53	14	22	118.1
KA0436	K35R	ANCH16	023 10 35	023 15 51	5.27	38.7	4	FA22	38.7	696	023 11 36	023 12 08	32		
KA0436	K35R	ANCH16	023 10 35	023 15 51	5.27	38.7	4	FA22	38.7	789	023 13 09	023 13 39	30		
KA0436	K35R	ANCH16	023 10 35	023 15 51	5.27	19.8	2	FA22	19.8	894	023 14 54	023 15 08	14	21.7	118.9

Anchor 17

CALLSIGN	TYPE	TRACK ID	TIME	TIME	TANKER TRACK TIME H/MM	OFFLOAD	NUMBER	TYPE	OFFLOAD	Entry Time (M)	ARCT	AREX	TIME	FUEL ABOVE BINGO	TANKER FUEL AVAILABLE
KA0425	K35R	**ANCH17**	023 09 53	023 16 31	6.63	46.1	1	E8C	46.1	665	023 11 05	023 11 25	20		
KA0425	K35R	**ANCH17**	023 09 53	023 16 31	6.63	46.1	1	E8C	46.1	875	023 14 35	023 14 55	20	21.5	113.7
KA0460	K35R	**ANCH17**	023 14 56	023 21 33	6.62	46.1	1	E8C	46.1	968	023 16 08	023 16 28	20		
KA0460	K35R	**ANCH17**	023 14 56	023 21 33	6.62	46.1	1	E8C	46.1	1178	023 19 38	023 19 58	20	21.6	113.8

Anchor 18

CALLSIGN	TYPE	TRACK ID	TIME	TIME	TANKER TRACK TIME H/MM	OFFLOAD	NUMBER	TYPE	OFFLOAD	Entry Time (M)	ARCT	AREX	TIME	FUEL ABOVE BINGO	TANKER FUEL AVAILABLE
KBIL74	K35R	ANCH18	023 06 31	023 09 26	2.92	27.7	8	A10A	27.7	470	023 07 50	023 08 21	31	63.2	90.9
KBIL46	K35R	ANCH18	023 10 41	023 17 38	6.95	5.6	6	A10A	5.6	720	023 12 00	023 12 18	18		
KBIL46	K35R	ANCH18	023 10 41	023 17 38	6.95	1.6	2	A10A	1.6	932	023 15 32	023 15 40	8		
KBIL46	K35R	ANCH18	023 10 41	023 17 38	6.95	7.4	8	A10A	7.4	970	023 16 10	023 16 33	23	38.7	53.3
KBIL47	K35R	ANCH18	023 10 41	023 13 36	2.92	27.7	8	A10A	27.7	720	023 12 00	023 12 31	31	63.4	91.1
KBIL20	K35R	ANCH18	023 01 54	023 08 04	6.17	14.2	4	F16C	14.2	194	023 03 14	023 03 42	28		
KBIL20	K35R	ANCH18	023 01 54	023 08 04	6.17	9.1	2	F16C	9.1	240	023 04 00	023 04 12	12		
KBIL20	K35R	ANCH18	023 01 54	023 08 04	6.17	9.1	2	F16C	9.1	287	023 04 47	023 04 59	12		
KBIL20	K35R	ANCH18	023 01 54	023 08 04	6.17	27.1	6	F16C	27.1	316	023 05 16	023 06 14	58		
KBIL20	K35R	ANCH18	023 01 54	023 08 04	6.17	9	2	F16C	9	408	023 06 48	023 07 00	12	29.3	97.8
KBIL67	K35R	ANCH18	023 06 15	023 12 57	6.70	17.5	4	F16C	17.5	455	023 07 35	023 08 08	33		
KBIL67	K35R	ANCH18	023 06 15	023 12 57	6.70	8.5	2	F16C	8.5	519	023 08 39	023 08 51	12		
KBIL67	K35R	ANCH18	023 06 15	023 12 57	6.70	8.5	2	F16C	8.5	562	023 09 22	023 09 34	12		
KBIL67	K35R	ANCH18	023 06 15	023 12 57	6.70	8.5	2	F16C	8.5	606	023 10 06	023 10 18	12		
KBIL67	K35R	ANCH18	023 06 15	023 12 57	6.70	24.5	6	F16C	24.5	649	023 10 49	023 11 54	65	23.4	90.9
KBIL51	K35R	ANCH18	023 10 42	023 15 53	5.18	23.7	2	F15E	23.7	722	023 12 02	023 12 16	14		
KBIL51	K35R	ANCH18	023 10 42	023 15 53	5.18	16	4	F16C	16	742	023 12 22	023 12 48	26		
KBIL51	K35R	ANCH18	023 10 42	023 15 53	5.18	38.3	4	F15E	38.3	784	023 13 04	023 13 27	23		
KBIL51	K35R	ANCH18	023 10 42	023 15 53	5.18	16	4	F16C	16	823	023 13 43	023 14 09	26		
KBIL51	K35R	ANCH18	023 10 42	023 15 53	5.18	16	4	F16C	16	863	023 14 23	023 14 50	27	3.6	113.6
KBIL30	K35R	ANCH18	023 02 39	023 08 46	6.12	8.4	2	F16C	8.4	239	023 03 59	023 04 11	12		
KBIL30	K35R	ANCH18	023 02 39	023 08 46	6.12	4.9	2	F16C	4.9	420	023 07 00	023 07 10	10	90.8	104.1
KBIL30	K35R	ANCH18	023 09 24	023 14 33	5.15	23.7	2	F15E	23.7	644	023 10 44	023 10 58	14		
KBIL30	K35R	ANCH18	023 09 24	023 14 33	5.15	8	2	F16C	8	661	023 11 01	023 11 13	12		
KBIL30	K35R	ANCH18	023 09 24	023 14 33	5.15	38.3	4	F15E	38.3	720	023 12 00	023 12 23	23		
KBIL30	K35R	ANCH18	023 09 24	023 14 33	5.15	16	4	F16C	16	783	023 13 03	023 13 29	26	28.1	114.1
KBIL34	K35R	ANCH18	023 09 36	023 13 12	3.60	38.3	4	F15E	38.3	656	023 10 56	023 11 19	23		
KBIL34	K35R	ANCH18	023 09 36	023 13 12	3.60	8	2	F16C	8	716	023 11 56	023 12 08	12	85.5	131.8
KBIL53	K35R	ANCH18	023 04 53	023 11 41	6.80	17.6	4	F18	17.6	373	023 06 13	023 06 33	20		
KBIL53	K35R	ANCH18	023 04 53	023 11 41	6.80	1.3	1	EA6B	1.3	413	023 06 53	023 07 00	7		
KBIL53	K35R	ANCH18	023 04 53	023 11 41	6.80	33.3	8	F18	33.3	470	023 07 50	023 08 48	58		
KBIL53	K35R	ANCH18	023 04 53	023 11 41	6.80	7.9	2	F18	7.9	557	023 09 17	023 09 28	11		
KBIL53	K35R	ANCH18	023 04 53	023 11 41	6.80	6.8	1	F18	6.8	590	023 09 50	023 09 59	9		
KBIL53	K35R	ANCH18	023 04 53	023 11 41	6.80	17.1	4	F18	17.1	617	023 10 17	023 10 37	20	5.6	89.6
KBIL33	K35R	ANCH18	023 09 36	023 15 23	5.78	6.8	1	F18	6.8	656	023 10 56	023 11 05	9		
KBIL33	K35R	ANCH18	023 09 36	023 15 23	5.78	17.1	4	F18	17.1	667	023 11 07	023 11 27	20		
KBIL33	K35R	ANCH18	023 09 36	023 15 23	5.78	6.8	1	F18	6.8	695	023 11 35	023 11 44	9		
KBIL33	K35R	ANCH18	023 09 36	023 15 23	5.78	17.1	4	F18	17.1	716	023 11 56	023 12 16	20		
KBIL33	K35R	ANCH18	023 09 36	023 15 23	5.78	44.3	8	F18	44.3	745	023 12 25	023 14 03	98		
KBIL33	K35R	ANCH18	023 09 36	023 15 23	5.78	6.8	1	F18	6.8	850	023 14 10	023 14 19	9	2.6	101.5
KBIL14	K35R	ANCH18	023 07 57	023 11 35	3.63	43.4	8	F18	43.4	557	023 09 17	023 10 15	58		
KBIL14	K35R	ANCH18	023 07 57	023 11 35	3.63	1.3	1	EA6B	1.3	623	023 10 23	023 10 30	7	83.2	127.9
KBIL32	K35R	ANCH18	023 09 36	023 14 17	4.68	27.2	4	F18	27.2	656	023 10 56	023 11 21	25		
KBIL32	K35R	ANCH18	023 09 36	023 14 17	4.68	6.8	1	F18	6.8	706	023 11 46	023 11 55	9		
KBIL32	K35R	ANCH18	023 09 36	023 14 17	4.68	13.6	2	F18	13.6	728	023 12 08	023 12 22	14		
KBIL32	K35R	ANCH18	023 09 36	023 14 17	4.68	17.1	4	F18	17.1	773	023 12 53	023 13 13	20	52.2	116.9
KBIL25	K35R	ANCH18	023 09 03	023 13 28	4.42	38.3	8	F18	38.3	623	023 10 23	023 11 16	53		
KBIL25	K35R	ANCH18	023 09 03	023 13 28	4.42	6.8	1	F18	6.8	734	023 12 14	023 12 23	9	74.5	119.6
KBIL44	K35R	ANCH18	023 03 39	023 09 48	6.15	21.3	8	F16C	21.3	299	023 04 59	023 05 29	30		
KBIL44	K35R	ANCH18	023 03 39	023 09 48	6.15	16.5	2	FA22	16.5	363	023 06 03	023 06 16	13		
KBIL44	K35R	ANCH18	023 03 39	023 09 48	6.15	30.8	4	FA22	30.8	421	023 07 01	023 07 32	31		
KBIL44	K35R	ANCH18	023 03 39	023 09 48	6.15	37.3	8	F16C	37.3	486	023 08 06	023 08 44	38	2.5	108.4
KBIL13	K35R	ANCH18	023 07 34	023 12 34	5.00	37.3	8	F16C	37.3	534	023 08 54	023 09 32	38		
KBIL13	K35R	ANCH18	023 07 34	023 12 34	5.00	37.3	8	F16C	37.3	581	023 09 41	023 10 19	38		
KBIL13	K35R	ANCH18	023 07 34	023 12 34	5.00	37.3	8	F16C	37.3	628	023 10 28	023 11 06	38		
KBIL13	K35R	ANCH18	023 07 34	023 12 34	5.00	9	2	F16C	9	678	023 11 18	023 11 30	12	0.1	121
KBIL47	K35R	ANCH18	023 04 01	023 12 10	8.15	14.9	2	FA22	14.9	321	023 05 21	023 05 33	12		
KBIL47	K35R	ANCH18	023 04 01	023 12 10	8.15	20	2	FA22	20	493	023 08 13	023 08 27	14		
KBIL47	K35R	ANCH18	023 04 01	023 12 10	8.15	7.8	2	F16C	7.8	512	023 08 32	023 08 43	11		
KBIL47	K35R	ANCH18	023 04 01	023 12 10	8.15	9	2	F16C	9	542	023 09 02	023 09 14	12		
KBIL47	K35R	ANCH18	023 04 01	023 12 10	8.15	20	2	FA22	20	589	023 09 49	023 10 03	14		
KBIL47	K35R	ANCH18	023 04 01	023 12 10	8.15	9	2	F16C	9	633	023 10 33	023 10 45	12	9.7	90.4
KBIL05	K35R	ANCH18	023 06 57	023 11 53	4.93	9	2	F16C	9	497	023 08 17	023 08 29	12		
KBIL05	K35R	ANCH18	023 06 57	023 11 53	4.93	7.8	2	F16C	7.8	554	023 09 14	023 09 25	11		
KBIL05	K35R	ANCH18	023 06 57	023 11 53	4.93	9	2	F16C	9	588	023 09 48	023 10 00	12		
KBIL05	K35R	ANCH18	023 06 57	023 11 53	4.93	7.8	2	F16C	7.8	638	023 10 38	023 10 49	11	83.8	117.4

Anchor 19

CALLSIGN	TYPE	TRACK ID	TIME	TIME	TANKER TRACK TIME H/MM	OFFLOAD	NUMBER	TYPE	OFFLOAD	Entry Time (M)	ARCT	AREX	TIME	FUEL ABOVE BINGO	TANKER FUEL AVAILABLE
KBIL07	K35R	ANCH19	023 13 59	023 18 33	4.57	21.5	2	F15E	21.5	923	023 15 23	023 15 37	14		
KBIL07	K35R	ANCH19	023 13 59	023 18 33	4.57	85.7	8	F15E	85.7	968	023 16 08	023 17 30	82	13.4	120.6
KBIL32	K35R	ANCH19	023 16 16	023 20 29	4.22	64.3	6	F15E	64.3	1060	023 17 40	023 18 38	58		
KBIL32	K35R	ANCH19	023 16 16	023 20 29	4.22	42.8	4	F15E	42.8	1135	023 18 55	023 19 25	30	18.3	125.4
KBIL45	K35R	ANCH19	023 18 39	024 00 18	5.39	21.4	2	F15E	21.4	1203	023 20 03	023 20 17	14		
KBIL45	K35R	ANCH19	023 18 39	024 00 18	5.39	21.4	2	F15E	21.4	1263	023 21 03	023 21 17	14		
KBIL45	K35R	ANCH19	023 18 39	024 00 18	5.39	23	6	F16C	23	1291	023 21 31	023 22 29	58		
KBIL45	K35R	ANCH19	023 18 39	024 00 18	5.39	8.2	2	F16C	8.2	1382	023 23 02	023 23 14	12	32.1	106.1
KBIL33	K35R	ANCH19	023 16 23	023 22 24	6.02	21.4	2	F15E	21.4	1067	023 17 47	023 18 01	14		
KBIL33	K35R	ANCH19	023 16 23	023 22 24	6.02	21.4	2	F15E	21.4	1127	023 18 47	023 19 01	14		
KBIL33	K35R	ANCH19	023 16 23	023 22 24	6.02	21.4	2	F15E	21.4	1195	023 19 55	023 20 09	14		
KBIL33	K35R	ANCH19	023 16 23	023 22 24	6.02	6.6	2	F16C	6.6	1270	023 21 10	023 21 21	11	32.4	103.2
KBIL35	K35R	ANCH19	023 09 44	023 13 24	3.67	6.8	1	F18	6.8	668	023 11 08	023 11 17	9		
KBIL35	K35R	ANCH19	023 09 44	023 13 24	3.67	15.8	4	F18	15.8	720	023 12 00	023 12 19	19	104.1	126.7
KBIL64	K35R	ANCH19	023 12 13	023 18 32	6.32	1.3	1	EA6B	1.3	817	023 13 37	023 13 44	7		
KBIL64	K35R	ANCH19	023 12 13	023 18 32	6.32	8.5	2	F18	8.5	833	023 13 53	023 14 05	12		
KBIL64	K35R	ANCH19	023 12 13	023 18 32	6.32	6.8	1	F18	6.8	889	023 14 49	023 14 58	9		
KBIL64	K35R	ANCH19	023 12 13	023 18 32	6.32	17	4	F18	17	915	023 15 15	023 15 44	29		
KBIL64	K35R	ANCH19	023 12 13	023 18 32	6.32	34	8	F18	34	965	023 16 05	023 17 28	83	25.7	93.3
KBIL30	K35R	ANCH19	023 16 06	023 21 16	5.17	34.1	8	F18	34.1	1050	023 17 30	023 18 36	66		
KBIL30	K35R	ANCH19	023 16 06	023 21 16	5.17	17.1	4	F18	17.1	1141	023 19 01	023 19 21	20		
KBIL30	K35R	ANCH19	023 16 06	023 21 16	5.17	17.1	4	F18	17.1	1191	023 19 51	023 20 11	20	42.4	110.7
KBIL66	K35R	ANCH19	023 12 19	023 17 16	4.95	6.8	1	F18	6.8	823	023 13 43	023 13 52	9		
KBIL66	K35R	ANCH19	023 12 19	023 17 16	4.95	8.5	2	F18	8.5	883	023 14 43	023 14 55	12		
KBIL66	K35R	ANCH19	023 12 19	023 17 16	4.95	30.6	6	F18	30.6	923	023 15 23	023 16 11	48	65.6	111.5
KBIL17	K35R	ANCH19	023 15 05	023 19 42	4.62	39.1	8	F18	39.1	989	023 16 29	023 17 50	81		
KBIL17	K35R	ANCH19	023 15 05	023 19 42	4.62	6.8	1	F18	6.8	1108	023 18 28	023 18 37	9	70	115.9
KBIL02	K35R	ANCH19	023 13 19	023 18 13	4.90	9.3	2	F18	9.3	883	023 14 43	023 14 55	12		
KBIL02	K35R	ANCH19	023 13 19	023 18 13	4.90	34.1	8	F18	34.1	937	023 15 37	023 16 38	61		
KBIL02	K35R	ANCH19	023 13 19	023 18 13	4.90	27.2	4	F18	27.2	1003	023 16 43	023 17 08	25	44.3	114.9
KBIL27	K35R	ANCH19	023 16 03	023 19 37	3.57	28.4	6	F18	28.4	1047	023 17 27	023 18 06	39		
KBIL27	K35R	ANCH19	023 16 03	023 19 37	3.57	17.1	4	F18	17.1	1092	023 18 12	023 18 32	20	85	130.5
KBIL36	K35R	ANCH19	023 03 07	023 08 19	5.20	18.7	4	F16C	18.7	271	023 04 31	023 04 52	21		
KBIL36	K35R	ANCH19	023 03 07	023 08 19	5.20	18.7	4	F16C	18.7	319	023 05 19	023 05 40	21		
KBIL36	K35R	ANCH19	023 03 07	023 08 19	5.20	18.7	4	F16C	18.7	366	023 06 06	023 06 27	21		
KBIL36	K35R	ANCH19	023 03 07	023 08 19	5.20	18.7	4	F16C	18.7	414	023 06 54	023 07 15	21	42.3	117.1
KBIL07	K35R	ANCH19	023 07 04	023 12 47	5.72	14.9	2	FA22	14.9	508	023 08 28	023 08 40	12		
KBIL07	K35R	ANCH19	023 07 04	023 12 47	5.72	31.2	8	F16C	31.2	539	023 08 59	023 10 07	68		
KBIL07	K35R	ANCH19	023 07 04	023 12 47	5.72	31.2	8	F16C	31.2	623	023 10 23	023 11 43	80	33.2	110.5
KBIL44	K35R	ANCH19	023 10 29	023 16 08	5.65	56.4	6	FA22	56.4	713	023 11 53	023 12 53	60		
KBIL44	K35R	ANCH19	023 10 29	023 16 08	5.65	16.8	2	FA22	16.8	812	023 13 32	023 13 45	13		
KBIL44	K35R	ANCH19	023 10 29	023 16 08	5.65	16.8	2	FA22	16.8	890	023 14 50	023 15 03	13	23.8	113.8
KBIL16	K35R	ANCH19	023 08 44	023 13 43	4.98	7.8	2	F16C	7.8	608	023 10 08	023 10 19	11		
KBIL16	K35R	ANCH19	023 08 44	023 13 43	4.98	13.9	8	F16C	13.9	623	023 10 23	023 10 49	26		
KBIL16	K35R	ANCH19	023 08 44	023 13 43	4.98	16.8	2	FA22	16.8	657	023 10 57	023 11 10	13		
KBIL16	K35R	ANCH19	023 08 44	023 13 43	4.98	8.1	2	F16C	8.1	676	023 11 16	023 11 28	12		
KBIL16	K35R	ANCH19	023 08 44	023 13 43	4.98	8.1	2	F16C	8.1	722	023 12 02	023 12 14	12		
KBIL16	K35R	ANCH19	023 08 44	023 13 43	4.98	18.8	2	FA22	18.8	744	023 12 24	023 12 38	14	45.6	119.1
KBIL23	K35R	ANCH19	023 08 56	023 13 33	4.62	56.4	6	FA22	56.4	620	023 10 20	023 11 20	60		
KBIL23	K35R	ANCH19	023 08 56	023 13 33	4.62	16.8	2	FA22	16.8	735	023 12 15	023 12 28	13	51.1	124.3

Anchor 20

CALLSIGN	TYPE	TRACK ID	TIME	TIME	TANKER TRACK TIME H/MM	OFFLOAD	NUMBER	TYPE	OFFLOAD	Entry Time (M)	ARCT	AREX	TIME	FUEL ABOVE BINGO	TANKER FUEL AVAILABLE
KBIL14	K35R	**ANCH20**	023 01 18	023 03 33	2.25	52.3	1	E3A	52.3	144	023 02 24	023 02 45	21	96.5	148.8
KA0421	K35R	**ANCH20**	023 08 30	023 10 45	2.25	52.3	1	E3A	52.3	576	023 09 36	023 09 57	21	96.5	148.8

Anchor 21

CALLSIGN	TYPE	TRACK ID	TIME	TIME	TANKER TRACK TIME H/MM	OFFLOAD	NUMBER	TYPE	OFFLOAD	Entry Time (M)	ARCT	AREX	TIME	FUEL ABOVE BINGO	TANKER FUEL AVAILABLE
KBIL06	K35R	ANCH21	022 23 53	023 04 05	4.12	8.5	2	F18	8.5	70	023 01 10	023 01 22	12		
KBIL06	K35R	ANCH21	022 23 53	023 04 05	4.12	15.3	3	F18	15.3	120	023 02 00	023 02 29	29		
KBIL06	K35R	ANCH21	022 23 53	023 04 05	4.12	8.5	2	F18	8.5	169	023 02 49	023 03 01	12	87.9	120.2
KA0401	K35R	ANCH21	023 02 09	023 08 05	5.93	6.8	1	F18	6.8	206	023 03 26	023 03 35	9		
KA0401	K35R	ANCH21	023 02 09	023 08 05	5.93	34	8	F18	34	221	023 03 41	023 04 51	70		
KA0401	K35R	ANCH21	023 02 09	023 08 05	5.93	25.5	6	F18	25.5	297	023 04 57	023 05 40	43		
KA0401	K35R	ANCH21	023 02 09	023 08 05	5.93	17.1	4	F18	17.1	348	023 05 48	023 06 08	20		
KA0401	K35R	ANCH21	023 02 09	023 08 05	5.93	17	4	F18	17	385	023 06 25	023 07 02	37	1	101.4
KBIL10	K35R	ANCH21	023 00 45	023 05 11	4.43	8.5	2	F18	8.5	122	023 02 02	023 02 14	12		
KBIL10	K35R	ANCH21	023 00 45	023 05 11	4.43	8.5	2	F18	8.5	172	023 02 52	023 03 04	12		
KBIL10	K35R	ANCH21	023 00 45	023 05 11	4.43	30.6	6	F18	30.6	198	023 03 18	023 04 07	49	70.7	118.3
KA0402	K35R	ANCH21	023 02 52	023 07 13	4.35	17.1	4	F18	17.1	249	023 04 09	023 04 29	20		
KA0402	K35R	ANCH21	023 02 52	023 07 13	4.35	44.2	8	F18	44.2	286	023 04 46	023 06 09	83	59.4	120.7
KBIL16	K35R	ANCH21	023 01 26	023 07 16	5.83	8.5	2	F18	8.5	163	023 02 43	023 02 55	12		
KBIL16	K35R	ANCH21	023 01 26	023 07 16	5.83	23.3	6	F18	23.3	229	023 03 49	023 04 35	46		
KBIL16	K35R	ANCH21	023 01 26	023 07 16	5.83	17.1	4	F18	17.1	299	023 04 59	023 05 19	20		
KBIL16	K35R	ANCH21	023 01 26	023 07 16	5.83	17	4	F18	17	335	023 05 35	023 06 13	38	37.8	103.7
KA0433	K35R	ANCH21	023 10 34	023 16 11	5.62	38.6	4	FA22	38.6	711	023 11 51	023 12 24	33		
KA0433	K35R	ANCH21	023 10 34	023 16 11	5.62	38.7	4	FA22	38.7	835	023 13 55	023 14 26	31		
KA0433	K35R	ANCH21	023 10 34	023 16 11	5.62	18.4	4	F16C	18.4	878	023 14 38	023 15 08	30	18.3	114
KA0455	K35R	ANCH21	023 14 08	023 19 19	5.18	19.8	2	FA22	19.8	925	023 15 25	023 15 39	14		
KA0455	K35R	ANCH21	023 14 08	023 19 19	5.18	9.2	2	F16C	9.2	943	023 15 43	023 15 55	12		
KA0455	K35R	ANCH21	023 14 08	023 19 19	5.18	37.8	4	FA22	37.8	979	023 16 19	023 16 50	31		
KA0455	K35R	ANCH21	023 14 08	023 19 19	5.18	18	4	F16C	18	1039	023 17 19	023 17 39	20		
KA0455	K35R	ANCH21	023 14 08	023 19 19	5.18	30.5	8	F16C	30.5	1063	023 17 43	023 18 18	35	3.7	119
KA0440	K35R	ANCH21	023 11 08	023 15 06	3.97	19.8	2	FA22	19.8	745	023 12 25	023 12 39	14		
KA0440	K35R	ANCH21	023 11 08	023 15 06	3.97	12	8	F16C	12	817	023 13 37	023 14 02	25	97.4	129.2
KA0453	K35R	ANCH21	023 13 28	023 18 40	5.20	18.9	2	FA22	18.9	885	023 14 45	023 14 59	14		
KA0453	K35R	ANCH21	023 13 28	023 18 40	5.20	7.9	2	F16C	7.9	913	023 15 13	023 15 24	11		
KA0453	K35R	ANCH21	023 13 28	023 18 40	5.20	18	4	F16C	18	947	023 15 47	023 16 07	20		
KA0453	K35R	ANCH21	023 13 28	023 18 40	5.20	18	4	F16C	18	993	023 16 33	023 16 53	20		
KA0453	K35R	ANCH21	023 13 28	023 18 40	5.20	30.5	8	F16C	30.5	1022	023 17 02	023 17 37	35	24.7	118
KBIL71	K35R	ANCH21	023 12 39	023 17 59	5.33	18.9	2	FA22	18.9	836	023 13 56	023 14 10	14		
KBIL71	K35R	ANCH21	023 12 39	023 17 59	5.33	27.2	6	F16C	27.2	901	023 15 01	023 15 37	36		
KBIL71	K35R	ANCH21	023 12 39	023 17 59	5.33	30.5	8	F16C	30.5	939	023 15 39	023 16 14	35		
KBIL71	K35R	ANCH21	023 12 39	023 17 59	5.33	30.5	8	F16C	30.5	980	023 16 20	023 16 55	35	10.9	118

Anchor 22

CALLSIGN	TYPE	TRACK ID	TIME	TIME	TANKER TRACK TIME H/MM	OFFLOAD	NUMBER	TYPE	OFFLOAD	Entry Time (M)	ARCT	AREX	TIME	FUEL ABOVE BINGO	TANKER FUEL AVAILABLE
KBIL15	K35R	**ANCH22**	023 01 26	023 08 56	7.50	13.6	2	F18	13.6	167	023 02 47	023 03 01	14		
KBIL15	K35R	**ANCH22**	023 01 26	023 08 56	7.50	13.6	2	F18	13.6	257	023 04 17	023 04 31	14		
KBIL15	K35R	**ANCH22**	023 01 26	023 08 56	7.50	22.1	4	F18	22.1	329	023 05 29	023 06 11	42		
KBIL15	K35R	**ANCH22**	023 01 26	023 08 56	7.50	13.6	2	F18	13.6	395	023 06 35	023 06 49	14		
KBIL15	K35R	**ANCH22**	023 01 26	023 08 56	7.50	17.1	4	F18	17.1	435	023 07 15	023 07 50	35	3.7	83.7
KA0413	K35R	**ANCH22**	023 07 05	023 12 38	5.55	13.6	2	F18	13.6	506	023 08 26	023 08 40	14		
KA0413	K35R	**ANCH22**	023 07 05	023 12 38	5.55	13.6	2	F18	13.6	555	023 09 15	023 09 29	14		
KA0413	K35R	**ANCH22**	023 07 05	023 12 38	5.55	13.6	2	F18	13.6	621	023 10 21	023 10 35	14		
KA0413	K35R	**ANCH22**	023 07 05	023 12 38	5.55	13.6	2	F18	13.6	677	023 11 17	023 11 31	14	51.8	106.2
KA0445	K35R	**ANCH22**	023 12 18	023 18 37	6.32	13.6	2	F18	13.6	819	023 13 39	023 13 53	14		
KA0445	K35R	**ANCH22**	023 12 18	023 18 37	6.32	27.2	4	F18	27.2	885	023 14 45	023 15 27	42		
KA0445	K35R	**ANCH22**	023 12 18	023 18 37	6.32	13.6	2	F18	13.6	979	023 16 19	023 16 33	14		
KA0445	K35R	**ANCH22**	023 12 18	023 18 37	6.32	20.4	3	F18	20.4	1015	023 16 55	023 17 31	36	22.7	97.5
KA0465	K35R	**ANCH22**	023 16 19	023 22 33	6.23	27.2	4	F18	27.2	1060	023 17 40	023 18 05	25		
KA0465	K35R	**ANCH22**	023 16 19	023 22 33	6.23	6.8	1	F18	6.8	1157	023 19 17	023 19 26	9		
KA0465	K35R	**ANCH22**	023 16 19	023 22 33	6.23	14.8	4	F18	14.8	1184	023 19 44	023 20 03	19		
KA0465	K35R	**ANCH22**	023 16 19	023 22 33	6.23	13.6	2	F18	13.6	1207	023 20 07	023 20 21	14		
KA0465	K35R	**ANCH22**	023 16 19	023 22 33	6.23	13.6	2	F18	13.6	1273	023 21 13	023 21 27	14	22.2	98.2
KA0403	K35R	**ANCH22**	023 04 15	023 11 45	7.50	8.5	2	F18	8.5	336	023 05 36	023 05 48	12		
KA0403	K35R	**ANCH22**	023 04 15	023 11 45	7.50	17	4	F18	17	385	023 06 25	023 07 01	36		
KA0403	K35R	**ANCH22**	023 04 15	023 11 45	7.50	13.6	2	F18	13.6	459	023 07 39	023 07 53	14		
KA0403	K35R	**ANCH22**	023 04 15	023 11 45	7.50	13.6	2	F18	13.6	559	023 09 19	023 09 33	14		
KA0403	K35R	**ANCH22**	023 04 15	023 11 45	7.50	13.6	2	F18	13.6	625	023 10 25	023 10 39	14	18.4	84.7
KA0461	K35R	**ANCH22**	023 15 13	023 19 23	4.17	27.2	4	F18	27.2	994	023 16 34	023 16 59	25		
KA0461	K35R	**ANCH22**	023 15 13	023 19 23	4.17	1.3	1	EA6B	1.3	1027	023 17 07	023 17 14	7		
KA0461	K35R	**ANCH22**	023 15 13	023 19 23	4.17	13.6	2	F18	13.6	1081	023 18 01	023 18 15	14	79.8	121.9
KA0404	K35R	**ANCH22**	023 05 12	023 11 39	6.45	13.6	2	F18	13.6	393	023 06 33	023 06 47	14		
KA0404	K35R	**ANCH22**	023 05 12	023 11 39	6.45	13.6	2	F18	13.6	451	023 07 31	023 07 45	14		
KA0404	K35R	**ANCH22**	023 05 12	023 11 39	6.45	13.6	2	F18	13.6	611	023 10 11	023 10 25	14	57.7	89.5

Anchor 23

CALLSIGN	TYPE	TRACK ID	TIME	TIME	TANKER TRACK TIME H/MM	OFFLOAD	NUMBER	TYPE	OFFLOAD	Entry Time (M)	ARCT	AREX	TIME	FUEL ABOVE BINGO	TANKER FUEL AVAILABLE
KBIL01	K35R	**ANCH23**	022 22 26	023 01 50	3.40	80.3	1	E3A	80.3	0	023 00 00	023 00 27	27	58	138.3
KA0411	K35R	**ANCH23**	023 06 26	023 09 50	3.40	80.3	1	E3A	80.3	480	023 08 00	023 08 27	27	58	138.3
KA0456	K35R	**ANCH23**	023 14 26	023 18 08	3.70	40.1	1	E3A	40.1	960	023 16 00	023 16 27	27		
KA0456	K35R	**ANCH23**	023 14 26	023 18 08	3.70	40.1	1	E3A	40.1	960	023 16 00	023 16 27	27	93.3	173.5

Appendix B. Tanker Fuel Consolidation & Time Analysis Schedule

Anchor 1

NUMBER	TYPE	RECEIVER FUEL REQUIREMENT	ARRIVAL TIME	CALLSIGN	SCHEDULED TRACK TIME	TIME MODIFICATION	REQUIRED TRACK TIME	NON-CONSOLIDATED TRACK TIME	TIME DELTA	RECEIVERS PER TANKER
2	A10A	10.5	117	KBIL17	11					
2	A10A	7.1	166		10	40	1.02	6.77	5.75	2
2	A10A	31.5	191	KA0416	58					
4	A10A	7.1	235		10					
2	A10A	21	286		36					
2	A10A	7.1	305		10					
2	A10A	6.2	307		10					
2	A10A	10.5	365		11					
2	A10A	12.4	378	KBIL64	27	95	4.28	4.17	-0.12	6
Tanker Added to Meet Time Requirement				KBIL64	Fuel 132.2			3.60	3.48	1
2	A10A	21.1	420	KBIL50	30	65	1.58	6.93	5.35	1
2	A10A	35.3	455	KBIL02	50					
2	A10A	6.2	465		10					
2	F16C	7.7	467		11					
2	F16C	6.2	473		10					
2	F16C	7.7	507		11					
2	F16C	10.5	528		11					
8	F16C	6.2	543		10					
2	F16C	6.2	546		10					
2	F117	7.7	547		11					
2	F16C	6.2	616	KA0431	10					
2	F16C	6.2	616	KA0431	10					
2	FA22	7.7	621	KA0431	11	120	4.75	4.37	-0.38	9
Tanker Added to Meet Time Requirement				KA0431	Fuel 133			3.55	3.17	3
6	FA22	33.8	663	KA0427	83					
4	FA22	17.9	672		20					
2	FA22	6.2	686		10					
4	FA22	8.5	695		12					
8	FA22	17.9	720		20					
2	FA22	8.5	745	KA0463	12					
4	F16C	17.9	768	KA0463	20					
4	F16C	8.2	784	KA0463	12					
4	F16C	10.4	817	KA0463	12					
2	FA22	15.7	998	KA0463	13	110	5.40	4.38	-1.02	5
Tanker Added to Meet Time Requirement				KA0463	Fuel 129.6			3.85	2.83	5
8	FA22	72.3	1051	KA0472	81					
8	FA22	12.9	1057	KA0434	18					
4	F16C	18.9	1072		14					
2	F16C	8.2	1100		12	80	3.42	2.63	-0.78	3
Tanker Added to Meet Time Requirement				KA0472	Fuel 139.1			2.98	2.20	1
2	F16C	75.5	1144	KBIL11	82					
2	F16C	8.2	1146		12					
2	FA22	8.2	1192		12	45	2.52	5.92	3.40	3

SOLN	
13	tanker sorties orignally required
11	tanker sorties required to satisfy anchor requirements
2	potential consolidation savings

Anchor 2

NUMBER	TYPE	RECEIVER FUEL REQUIREMENT	ARRIVAL TIME	CALLSIGN	SCHEDULED TRACK TIME	TIME MODIFICATION	REQUIRED TRACK TIME	NON-CONSOLIDATED TRACK TIME	TIME DELTA	RECEIVERS PER TANKER
1	R35U	67.6	432	KA0407	24					
1	R35U	67.8	1152		24	10	0.97	2.32	1.35	2

SOLN	
2	tanker sorties orignally required
1	tanker sorties required to satisfy anchor requirements
1	potential consolidation savings

Anchor 3

NUMBER	TYPE	RECEIVER FUEL REQUIREMENT	ARRIVAL TIME	CALLSIGN	SCHEDULED TRACK TIME	TIME MODIFICATION	REQUIRED TRACK TIME	NON-CONSOLIDATED TRACK TIME	TIME DELTA	RECEIVERS PER TANKER
2	F16C	9.3	194	KBIL21	12					
2	F16C	8.9	205		12					
2	F15A	15.7	239		12					
2	F16C	9.3	240		12					
2	F16C	8.9	243		12					
2	F16C	8.9	250		12					
4	F16C	17.8	279		27	65	2.73	6.73	4.00	7
2	F16C	9.3	286	KBIL10	12					
2	F16C	8.9	288		12					
2	FA22	18.7	299		14					
2	F15A	15.7	318		12					
2	F16C	8.9	323		12					
2	F16C	8.9	332		12					
2	F16C	9.3	333		12					
2	F16C	8.9	339		12					
4	F16C	17.8	368		27					
2	F16C	8.9	377		12	110	4.12	5.45	1.33	10
2	F16C	9.3	379	KBIL63	12					
2	F15A	15.6	391		12					
2	F15A	15.7	398		12					
2	F16C	8.9	412		12					
4	F16C	18.8	420		21					
2	F16C	7.7	421		11					
2	F16C	8.9	421		12					
2	F16C	7.3	425		11					
2	F16C	7	453		11					
2	F16C	8.9	457		12					
2	F16C	7.7	461		11	115	4.20	6.50	2.30	11
2	F16C	7.3	466	KBIL75	11					
2	F16C	8.3	467		12					
1	F18	6.8	469		9					
2	F15A	15.6	470		12					
4	F16C	18.8	470		21					
6	F16C	25.8	494		46					
6	F16C	24.3	502		51					
2	F16C	7.3	506		11	100	4.55	4.60	0.05	8
2	F16C	8.3	510	KBIL01	12					
4	F18	27.2	511		75					
2	FA22	18.7	525		14					
2	F16C	7	536		11					
8	F16C	32	546		53					
2	F15A	15.6	549		12	90	4.45	4.72	0.27	6
2	F16C	8.3	554	KBIL56	12					
6	F16C	24.9	565		45					
4	F16C	15	592		25					
8	F16C	32	606		54					
1	F18	6.8	617		9	85	3.83	5.23	1.40	5
8	F16C	32.2	628	KBIL24	75	65	2.33	3.97	1.63	1

Anchor 3 Continued

NUMBER	TYPE	RECEIVER FUEL REQUIREMENT	ARRIVAL TIME	CALLSIGN	SCHEDULED TRACK TIME	TIME MODIFICATION	REQUIRED TRACK TIME	NON-CONSOLIDATED TRACK TIME	TIME DELTA	RECEIVERS PER TANKER
2	F16C	7.5	678	KBIL67	11					
2	F15A	17.9	718		13					
2	F16C	8	739		12					
4	F18	17	775		31					
2	F16C	8	788	KBIL72	12					
2	F18	8.5	814	KBIL72	12					
4	F18	17	824	KBIL72	32					
2	F18	8.5	863	KBIL72	12					
6	F18	25.5	874	KBIL72	51					
2	F18	9.7	951	KBIL72	12	110	5.13	3.10	-2.03	4
Tanker Added to Meet Time Requirement				KBIL72	Fuel 89.0			8.13	6.10	6
2	F18	9.7	1001	KBIL23	12					
2	F18	9.7	1052		12					
2	F18	9.7	1102		12	45	1.35	5.88	4.53	3

SOLN	
13	tanker sorties orignally required
10	tanker sorties required to satisfy anchor requirements
3	potential consolidation savings

Anchor 4

NUMBER	TYPE	RECEIVER FUEL REQUIREMENT	ARRIVAL TIME	CALLSIGN	SCHEDULED TRACK TIME	TIME MODIFICATION	REQUIRED TRACK TIME	NON-CONSOLIDATED TRACK TIME	TIME DELTA	RECEIVERS PER TANKER
2	F18	13.6	359	KA0446	14					
2	F18	13.6	425		14					
6	F16C	28.8	683		64					
4	FA22	38.6	720		24					
2	F16C	9.6	785		12					
2	F16C	8.3	824		12	60	3.33	5.70	2.37	6
2	F16C	9.6	835	KA0473	12					
2	F15A	17.9	847		13					
2	FA22	17	848		13					
6	F16C	25.6	869		49					
8	F16C	34.2	873		70					
4	FA22	39.5	893		32					
2	FA22	17	927	KA0434	13	95	4.95	4.83	-0.12	6
Tanker Added to Meet Time Requirement				KA0435	Fuel 121.6			4.78	4.66	1
2	F15A	17.9	929	KBIL01	13					
2	FA22	19.7	929		14					
6	FA22	59.2	948		49					
2	F16C	9.3	949		12					
2	F16C	9	954		12					
2	F16C	8.9	961		12	90	3.37	4.87	1.50	6
2	F16C	6.6	967	KBIL12	11					
2	F16C	6.6	977		11	70	1.53	3.62	2.09	2
4	F16C	19	996	KBIL51	29					
4	FA22	39.4	1001		32					
2	F16C	9	1002		12					
2	FA22	17	1005		13	80	2.77	3.78	1.01	4
2	F16C	8.9	1007	KA0426	12					
2	F15A	17.9	1011		13					
6	FA22	59.2	1038		49					
2	F16C	6.6	1048		11					
2	FA22	17	1083		13					
2	FA22	19.7	1091		14					
2	F15A	17.9	1093		13					
6	FA22	59.1	1109		52	100	4.62	5.18	0.56	8
2	FA22	15.7	1156	KBIL03	13	65	1.30	4.18	2.88	1
2	F15E	19.8	1205	KBIL23	13					
2	F15E	19.8	1270		13					
2	F15E	19.8	1335		13	45	1.40	3.72	2.32	3

SOLN	
12	tanker sorties orignally required
9	tanker sorties required to satisfy anchor requirements
3	potential consolidation savings

Anchor 5

NUMBER	TYPE	RECEIVER FUEL REQUIREMENT	ARRIVAL TIME	CALLSIGN	SCHEDULED TRACK TIME	TIME MODIFICATION	REQUIRED TRACK TIME	NON-CONSOLIDATED TRACK TIME	TIME DELTA	RECEIVERS PER TANKER
2	FA22	10.5	437	KBIL74	11					
2	F15A	17.9	476		13					
2	FA22	10.5	511		11					
2	F15A	17.9	558		13					
2	F16C	7.2	595		11					
2	F15A	17.9	597		13					
2	F16C	7.7	600		11					
2	F16C	7.8	626		11					
2	F16C	7.2	635		11					
2	F15A	17.9	640		13	80	3.30	3.67	0.37	10
2	F16C	7.7	641	KBIL15	11					
2	F16C	7.8	666		11					
2	F16C	7.2	675		11					
2	F15A	17.9	679		13					
2	F16C	7.7	681		11					
2	F16C	7.8	707		11					
8	F16C	34.1	715		80					
2	F15A	17.9	722		13					
2	F16C	7.7	722		11	105	4.62	4.92	0.30	4
2	F16C	7.8	748	KBIL75	11					
2	F16C	9.6	759		12					
2	F15A	17.9	761		13					
4	F16C	17.4	788		33					
2	F15A	17.9	800		13	85	2.78	5.95	3.17	5
4	FA22	39.5	804	KBIL11	30					
4	F15E	35.6	832		38					
2	F15A	17.9	843		13					
6	F15E	54	847	KBIL20	53	80	3.57	3.35	-0.22	3
Tanker Added to Meet Time Requirement				KBIL20	Fuel 134.0			3.42	3.20	1
2	F15A	17.9	882	KBIL66	13					
6	F15E	53	892		52					
2	FA22	19.7	909		14					
2	F16C	8.4	915		12					
2	F16C	7.9	920		11	85	3.12	5.43	2.31	5
4	F15E	36.5	949	KBIL40	35					
2	F16C	8.4	957		12					
2	F16C	7.9	962		11					
2	F15A	17.9	964		13					
2	F16C	8.4	999		12					
2	F16C	7.9	1003		11					
2	F15E	18.3	1012		13					
2	F16C	8.4	1041		12					
2	F16C	7.9	1044		11					
2	F16C	8.4	1082		12					
2	F16C	7.9	1085		11	115	4.47	4.87	0.40	11
2	F16C	8.4	1124	KBIL06	12	35	0.78	3.4	2.62	1

SOLN	
10	tanker sorties orignally required
8	tanker sorties required to satisfy anchor requirements
2	potential consolidation savings

Anchor 6

NUMBER	TYPE	RECEIVER FUEL REQUIREMENT	ARRIVAL TIME	CALLSIGN	SCHEDULED TRACK TIME	TIME MODIFICATION	REQUIRED TRACK TIME	NON-CONSOLIDATED TRACK TIME	TIME DELTA	RECEIVERS PER TANKER
2	F16C	8.5	49	KBIL04	12					
8	F16C	34.8	50		80					
2	F16C	9	52		12					
2	F16C	8.5	91		12					
2	F16C	9	96		12					
2	F16C	8.2	100		12					
6	F16C	25.2	133		55	65	4.33	6.53	2.20	7
6	F16C	26.1	136	KBIL22	55					
2	F16C	9	140		12					
2	F16C	8.2	141		12					
2	FA22	20	145		14					
2	F16C	8.2	183		12					
2	F16C	9	184	KBIL21	12					
4	F16C	16.7	190	KBIL21	40					
4	F16C	17.4	204	KBIL21	30					
2	F16C	8.2	224	KBIL21	12					
2	F16C	9	228	KBIL21	12					
2	F16C	8.2	231	KBIL21	12	115	5.63	3.80	-1.83	5
Tanker Added to Meet Time Requirement				KBIL21	Fuel 89.8			7.00	5.17	6
2	FA22	20	242	KBIL04	14					
6	F16C	26.1	247		55					
2	F16C	8.5	260		12					
2	F16C	8.2	265		12					
2	F16C	9	272		12					
2	F16C	8.2	272		12					
2	F16C	8.2	306		12	95	3.73	6.30	2.57	7
2	F16C	8.2	314	KBIL53	12					
2	FA22	20	335		14					
8	F16C	38.2	341		39					
2	F16C	8.2	355		12					
8	F16C	38.2	389		39					
2	FA22	20	431		14	90	3.67	3.68	0.01	6
8	F16C	38.2	438	KBIL13	39					
2	F16C	9.3	485	KBIL13	12					
8	F16C	38.2	486	KBIL13	39					
2	F16C	8.5	525	KBIL57	12					
2	F16C	9.3	531		12					
2	F16C	8.5	569	KBIL03	12					
2	F16C	9.3	577	KBIL03	12					
2	F16C	8.4	611	KBIL03	12					
2	F16C	8.5	614	KBIL03	12					
2	F16C	9.3	623	KBIL03	12	110	4.73	2.40	-2.33	2
Tanker Added to Meet Fuel/Time Requirement				KBIL03	Fuel 114			5.20	2.87	5
Tanker Added to Meet Fuel/Time Requirement				KBIL13	Fuel 122.9			4.48		3
4	F16C	17.7	655	KBIL05	26					
2	F16C	8.5	658		12					
2	F15E	23.7	681		14					
2	F16C	8.4	700		12					
2	F15E	23.7	718		14	85	2.72	6.05	3.33	5
2	F15E	18.3	732	KBIL12	13	65	3.40	5.02	1.62	1
2	F16C	8.4	744	KBIL21	12					
2	F15E	23.7	759		14					
6	F15E	53.1	771	KBIL32	51					
2	F15E	23.7	796		14	80	2.85	2.37	-0.48	3
Tanker Added to Meet Time Requirement				KBIL32	Fuel 125.5			4.25	3.77	1

Anchor 6 Continued

NUMBER	TYPE	RECEIVER FUEL REQUIREMENT	ARRIVAL TIME	CALLSIGN	SCHEDULED TRACK TIME	TIME MODIFICATION	REQUIRED TRACK TIME	NON-CONSOLIDATED TRACK TIME	TIME DELTA	RECEIVERS PER TANKER
2	F18	8.5	894	KBIL05	12					
6	F18	30.6	981		61					
2	F18	8.5	982		12					
1	F18	6.8	994		9					
2	F18	13.6	1045		14	85	3.22	6.30	3.08	5
8	F18	34	1055	KBIL41	89					
8	F18	44.2	1060		81					
8	F18	39.1	1112		78	75	5.38	5.98	0.60	3
8	F18	34	1154	KBIL20	86					
7	F18	47.6	1162	KBIL60	81					
4	F18	17	1193		38					
2	F18	8.5	1242		12					
2	F18	8.5	1268		12					
2	F18	8.5	1271		12	90	5.52	4.88	-0.64	5
Tanker Added to Meet Time Requirement				KBIL60	Fuel 125.4			4.45	3.81	1
5	F18	23.8	1277	KBIL43	53					
2	F18	8.5	1320		12					
2	F18	8.5	1370		12	45	2.03	5.02	2.99	3

SOLN	
19	tanker sorties orignally required
17	tanker sorties required to satisfy anchor requirements
2	potential consolidation savings

Anchor 7

NUMBER	TYPE	RECEIVER FUEL REQUIREMENT	ARRIVAL TIME	CALLSIGN	SCHEDULED TRACK TIME	TIME MODIFICATION	REQUIRED TRACK TIME	NON-CONSOLIDATED TRACK TIME	TIME DELTA	RECEIVERS PER TANKER
8	FA22	75.2	510	KA0415	62					
4	FA22	37.6	573		30	40	2.20	2.52	0.32	2
6	FA22	56.4	604	KA0424	46					
2	FA22	18.8	604		14					
4	FA22	37.6	652	KA0470	45					
4	FA22	37.6	667	KA0470	45	80	3.83	3.05	-0.78	2
Tanker Added to Meet Time Requirement				KA0470	Fuel 125.2			4.30	3.52	2
8	F16C	35.9	813	KBIL26	37					
8	F16C	35.9	860	KBIL26	37					
2	FA22	18.9	902	KBIL70	14					
2	F16C	6.6	1067		11					
2	FA22	17	1074		13					
8	F16C	32.9	1076		36					
2	F16C	6.6	1108		11	95	4.23	3.2	-1.03	5
Tanker Added to Meet Time Requirement				KBIL26	Fuel 154.1			1.72	0.69	2
8	F16C	32.9	1120	KA0467	36					
2	F16C	6.6	1148		11					
2	FA22	17	1152		13					
8	F16C	32.9	1163		36	80	2.93	5.72	2.79	4
8	F16C	32.9	1207	KA0422	36					
2	FA22	17	1230		13					
2	FA22	17	1308		13	45	1.78	3.8	2.02	3

SOLN	
8	tanker sorties orignally required
7	tanker sorties required to satisfy anchor requirements
1	potential consolidation savings

Anchor 8

NUMBER	TYPE	RECEIVER FUEL REQUIREMENT	ARRIVAL TIME	CALLSIGN	SCHEDULED TRACK TIME	TIME MODIFICATION	REQUIRED TRACK TIME	NON-CONSOLIDATED TRACK TIME	TIME DELTA	RECEIVERS PER TANKER
2	F16C	8.2	372	KA0405	12					
2	F16C	8.2	416		12					
2	F16C	8.2	459		12					
2	F16C	8.2	502		12					
8	F18	34	508		81					
8	F18	34	547		81					
8	F18	34	607		70					
2	F16C	7.3	631		11	70	6.02	8.02	2.00	8
2	F16C	7.3	672	KA0414	11					
2	F16C	7.3	712		11					
2	F16C	7.3	752		11					
8	F16C	13.9	1027		26	80	2.32	4.32	2.00	4
	FA22	39.5	1129	KBIL26	45					
6	FA22	59.2	1197	KA0417	67	70	3.03	2.85	-0.18	1
Tanker Added to Meet Time Requirement				KBIL26	Fuel 129.6			4.00	3.82	1
2	FA22	19.8	1243	KA0464	14					
6	FA22	59.2	1286		68					
2	FA22	19.8	1333		14					
2	FA22	19.7	1376		14					
2	FA22	19.8	1423		14	55	2.98	5.43	2.45	5

SOLN	
6	tanker sorties orignally required
5	tanker sorties required to satisfy anchor requirements
1	potential consolidation savings

Anchor 9

NUMBER	TYPE	RECEIVER FUEL REQUIREMENT	ARRIVAL TIME	CALLSIGN	SCHEDULED TRACK TIME	TIME MODIFICATION	REQUIRED TRACK TIME	NON-CONSOLIDATED TRACK TIME	TIME DELTA	RECEIVERS PER TANKER
1	E3A	49.8	0	KBIL02	20					
1	E3A	49.5	720		20					
1	E3A	55.4	864	KA0401	22	45	1.78	1.68	-0.10	2
Tanker Added to Meet Time Requirement				KA0401	Fuel 154.5			1.72	1.62	1
1	E3A	55.4	1296	KA0441	22	35	0.95	4.12	3.17	1

SOLN	
3	tanker sorties orignally required
3	tanker sorties required to satisfy anchor requirements
0	potential consolidation savings

Anchor 10

NUMBER	TYPE	RECEIVER FUEL REQUIREMENT	ARRIVAL TIME	CALLSIGN	SCHEDULED TRACK TIME	TIME MODIFICATION	REQUIRED TRACK TIME	NON-CONSOLIDATED TRACK TIME	TIME DELTA	RECEIVERS PER TANKER
2	FA22	18.7	213	KBIL31	14					
2	FA22	18.7	221		14					
2	F16C	7.5	244		11					
8	F16C	37	258		79					
2	F16C	7.1	266		11					
2	F16C	7.5	291		11	60	3.33	6.92	3.59	6
2	F16C	9	298	KBIL26	12					
2	F16C	7.1	308		11					
2	FA22	18.7	343		14					
2	F16C	9	344		12					
2	F16C	7.1	350		11					
6	F16C	27.7	352		59					
2	F16C	9	380		12	95	3.77	6.23	2.46	7
1	F18	6.8	380	KBIL50	9					
6	F16C	25.1	390		47	70	2.10	4.68	2.58	2
8	F16C	34.3	419	KBIL54	63					
4	F18	27.2	437	KBIL54	25					
3	F18	20.4	446	KBIL54	29					
2	F16C	8.9	469	KBIL54	12					
4	F16C	16.1	496	KBIL54	31					
4	F18	27.2	503	KBIL60	25					
2	F18	13.6	527		14	95	4.90	2.25	-2.65	2
Tanker Added to Meet Time Requirement				KBIL54	Fuel 144.7			8.30	5.65	5
2	F16C	9	560	KBIL35	12					
2	F117	10.4	623		12					
4	F18	17	623		31					
2	A10A	8	645		11					
4	F18	17	673		31					
4	F18	27.2	687		25					
2	F16C	8.9	700		12					
2	A10A	8	714		11	100	4.08	5.83	1.75	8
2	A10A	8	720	KBIL06	11					
4	F18	17	722		31					
2	F16C	8.9	748		12					
2	F18	8.3	748		12					
4	F18	27.2	753		25					
4	F16C	11.9	767		17					
4	F16C	18.5	779		29					
2	A10A	8	789		11					
2	A10A	6.3	794		10	105	4.38	4.43	0.05	9
2	F18	8.3	794	KBIL43	12	65	1.28	5	3.72	1
2	A10A	8	795	KBIL37	11					
2	F16C	8.4	795		12					
2	F16C	9.2	808		12					
6	F16C	17.5	810		32					
4	F16C	18.8	832		40					
2	F18	8.3	839		12	90	3.48	5.7	2.22	6
2	F16C	8.4	844	KBIL61	12					
2	A10A	6.3	859		10					
2	A10A	8	864		11					
4	F18	21.9	868		29					
2	F16C	5.6	873		10					
6	F16C	25.2	906	KBIL37	42					
2	A10A	6.3	924	KBIL37	10					
2	F16C	5.6	925	KBIL37	10					
2	F18	13.6	934	KBIL37	14	105	4.22	3.13	-1.09	5
Tanker Added to Meet Time Requirement				KBIL37	Fuel 92.4			6.67	5.58	4

Anchor 10 Continued

NUMBER	TYPE	RECEIVER FUEL REQUIREMENT	ARRIVAL TIME	CALLSIGN	SCHEDULED TRACK TIME	TIME MODIFICATION	REQUIRED TRACK TIME	NON-CONSOLIDATED TRACK TIME	TIME DELTA	RECEIVERS PER TANKER
4	F16C	18.6	958	KBIL45	21					
2	F16C	5.6	966		10					
4	FA22	38.6	970		24					
2	F15A	17.9	999		13					
4	F16C	15.3	1008		27					
2	F16C	6.4	1017		11					
6	F16C	19.6	1018	KBIL65	54	95	4.25	3.7	-0.55	6
Tanker Added to Meet Time Requirement				KBIL65	Fuel 126.6			3.80	3.25	1
2	A10A	6.4	1032	KBIL65	10					
2	F16C	6.6	1072		11					
6	F16C	21.6	1074	KBIL41	41					
2	F15A	17.9	1081	KBIL41	13					
2	A10A	6.4	1097	KBIL41	10					
6	F16C	19.5	1113	KBIL41	42					
4	A10A	12.8	1139	KBIL41	34					
2	F15A	17.9	1163		13	100	4.57	2.3	-2.27	3
Tanker Added to Meet Time Requirement				KBIL41	Fuel 129.4			3.62	1.35	5
2	A10A	6.4	1205	KBIL57	10					
2	F15A	17.9	1244		13					
2	A10A	6.4	1270		10	45	1.30	6.67	5.37	3

SOLN	
22	tanker sorties orignally required
16	tanker sorties required to satisfy anchor requirements
6	potential consolidation savings

Anchor 11

NUMBER	TYPE	RECEIVER FUEL REQUIREMENT	ARRIVAL TIME	CALLSIGN	SCHEDULED TRACK TIME	TIME MODIFICATION	REQUIRED TRACK TIME	NON-CONSOLIDATED TRACK TIME	TIME DELTA	RECEIVERS PER TANKER
4	F16C	19	944	KBIL13	28					
2	F16C	8.3	1142		12					
2	F16C	6.2	1151		11					
2	F16C	9.5	1187		12					
2	F16C	8.3	1188		12					
2	F16C	6.2	1194		11					
2	F16C	8.3	1234		12					
2	F16C	9.5	1237		12					
2	F16C	9.5	1287	KBIL37	12	45	2.78	2.58	-0.20	8
Tanker Added to Meet Time Requirement				KBIL37	Fuel 118.0			4.75	4.55	1

SOLN	
4	tanker sorties orignally required
2	tanker sorties required to satisfy anchor requirements
2	potential consolidation savings

Anchor 12

NUMBER	TYPE	RECEIVER FUEL REQUIREMENT	ARRIVAL TIME	CALLSIGN	SCHEDULED TRACK TIME	TIME MODIFICATION	REQUIRED TRACK TIME	NON-CONSOLIDATED TRACK TIME	TIME DELTA	RECEIVERS PER TANKER
1	E8C	81.6	288	KBIL13	27					
1	R35U	53.6	576		21	40	1.47	2.47	1.00	2
1	E4B	63.5	845	KA0420	23					
1	E8C	81.6	1008		27	70	2.00	2.37	0.37	2
1	R35U	53.6	1296	KA0452	21	35	0.93	2.40	1.47	1

SOLN	
5	tanker sorties orignally required
3	tanker sorties required to satisfy anchor requirements
2	potential consolidation savings

Anchor 13

NUMBER	TYPE	RECEIVER FUEL REQUIREMENT	ARRIVAL TIME	CALLSIGN	SCHEDULED TRACK TIME	TIME MODIFICATION	REQUIRED TRACK TIME	NON-CONSOLIDATED TRACK TIME	TIME DELTA	RECEIVERS PER TANKER
6	F18	25.5	447	KA0451	53					
8	F16C	31.6	748	KA0451	80					
2	F16C	7.9	801	KBIL31	11					
2	FA22	18.9	804		14					
2	FA22	18.8	820		14					
4	F16C	17.1	828	KA0451	33					
8	F16C	31.6	833	KA0451	79	65	5.82	1.78	-4.04	3
Tanker Added to Meet Time Requirement				KA0451	Fuel 179.6			4.12	0.08	4
6	F16C	23.7	843	KA0447	54					
6	FA22	56.6	868	KA0447	60					
8	F16C	35.9	906	KA0410	37					
2	F16C	7.9	928		11					
6	FA22	56.7	930	KA0450	46					
8	F16C	35.9	952	KA0447	37					
6	F16C	26.3	956	KA0450	46	95	6.43	2.52	-3.91	2
Tanker Added to Meet Time/Fuel Requirement				KA0447	Fuel 119.0			5.00	1.09	3
Tanker Added to Meet Time/Fuel Requirement				KA0450	Fuel 152.2			1.87		2
2	F16C	9.2	1018	KA0466	12					
2	F117	3.5	1027		9					
2	F18	8.5	1055		12	75	1.80	3.32	1.52	3
4	F18	22.1	1117	KA0442	38	35	1.22	4.37	3.15	1

SOLN	
8	tanker sorties orignally required
7	tanker sorties required to satisfy anchor requirements
1	potential consolidation savings

Anchor 14

NUMBER	TYPE	RECEIVER FUEL REQUIREMENT	ARRIVAL TIME	CALLSIGN	SCHEDULED TRACK TIME	TIME MODIFICATION	REQUIRED TRACK TIME	NON-CONSOLIDATED TRACK TIME	TIME DELTA	RECEIVERS PER TANKER
2	F15E	22.9	132	KBIL12	14					
2	F15E	22.9	207		14					
4	F15E	44.3	208		43					
2	F18	13.6	235		14	50	2.25	4.93	2.68	4
4	F15E	44.3	283	KBIL42	36					
2	F15E	22.7	319		14					
2	F16C	7.4	342		11					
2	F16C	8.9	353		12					
2	F15E	22.7	367		14	85	2.87	4.38	1.51	5
8	F16C	37.3	368	KBIL70	38					
4	F15E	44.1	373		36					
2	F16C	7.4	383		11					
6	F16C	26.7	384		43					
2	F15E	22.7	411		14					
2	F117	7.8	413		11	90	4.05	4.22	0.17	6
8	F16C	37.3	415	KBIL24	38					
2	F16C	7.4	423		11					
4	F16C	17.8	432		28					
2	F15E	22.7	442		14					
6	F16C	24.5	445		37	85	3.55	4.83	1.28	5
2	F15E	22.7	453	KBIL24.1	14					
8	F16C	37.3	463		38					
4	F16C	17.8	463		29					
2	F16C	7.4	464		11	80	2.87	5.52	2.65	4
6	F15E	65.2	487	KBIL73	56					
6	F16C	24.5	492		35					
2	F15E	22.7	493		14	75	3.00	5.92	2.92	3
8	F16C	37.3	510	KBIL62	38	65	1.72	7.25	5.53	1
4	F16C	17.4	510	KBIL54	41					
4	F16C	16	553	KBIL54	19					
2	F15E	22.7	569	KBIL33	14					
2	F15E	19.8	570		13					
2	F15E	22	571	KBIL52	14					
4	F18	17	585	KBIL52	31					
4	F15E	41.8	609	KBIL52	39					
3	F18	20.4	629	KBIL52	28					
4	F18	17	635	KBIL52	31	105	5.58	2.10	-3.48	2
Tanker Added to Meet Time/Fuel Requirement				KBIL52	Fuel 124.9			4.33	0.85	5
Tanker Added to Meet Time/Fuel Requirement				KBIL54	Fuel 121.3			4.92		2
2	F15E	22	646	KBIL15	14					
2	F15E	22	683		14					
8	F18	34.1	684		60					
2	F16C	5.7	685		10	80	2.97	4.93	1.97	4
8	F117	40.1	690	KBIL62.1	37					
4	F18	27.2	709		36					
2	F16C	5.7	727		10	75	2.63	5.00	2.37	3
8	F117	40.1	750	KBIL27	37					
2	F18	8.5	756		12					
6	F18	40.8	763		46					
4	F18	27.2	797		32					
4	F18	15.8	800		19	85	3.85	4.87	1.02	5

Anchor 14 Continued

NUMBER	TYPE	RECEIVER FUEL REQUIREMENT	ARRIVAL TIME	CALLSIGN	SCHEDULED TRACK TIME	TIME MODIFICATION	REQUIRED TRACK TIME	NON-CONSOLIDATED TRACK TIME	TIME DELTA	RECEIVERS PER TANKER
5	F18	23.9	833	KBIL73.1	39					
8	F18	49.3	850	KBIL11	65					
4	F18	17	853		33					
4	F18	17.1	883		20					
2	F18	8.5	923		12					
1	F18	6.8	929		9	90	4.47	4.07	-0.40	5
Tanker Added to Meet Time Requirement				KBIL11	Fuel 140.6			2.90	2.50	1
4	F18	17.1	932	KBIL63	20					
2	F18	8.5	952		12					
2	F18	8.5	973		12	45	1.48	4.13	2.65	3

SOLN	
17	tanker sorties orignally required
16	tanker sorties required to satisfy anchor requirements
1	potential consolidation savings

Anchor 15

NUMBER	TYPE	RECEIVER FUEL REQUIREMENT	ARRIVAL TIME	CALLSIGN	SCHEDULED TRACK TIME	TIME MODIFICATION	REQUIRED TRACK TIME	NON-CONSOLIDATED TRACK TIME	TIME DELTA	RECEIVERS PER TANKER
1	F18	6.8	217	KBIL22	9					
1	F18	6.8	278		9					
1	F18	6.8	283		9					
2	F18	13.6	332		21					
2	F16C	6.9	369		11					
1	F18	6.8	398		9					
2	F16C	6.9	414		11					
1	F18	6.8	426		9					
6	F16C	25.5	474		58	75	3.68	7.43	3.75	9
1	F18	6.8	492	KBIL27	9					
6	F16C	25.5	548		59					
8	F16C	37.3	595		38					
6	F16C	24.1	606		37					
2	FA22	18.8	635		14					
8	F16C	37.3	643		38	90	4.75	6.65	1.90	6
4	F16C	16	651	KBIL36	19					
6	F16C	26.8	651		29					
4	F18	17	661		31					
8	F16C	37.3	690		38					
4	F16C	16	696		19					
6	F16C	26.8	697		29	90	4.25	5.35	1.10	6
6	F18	25.5	699	KBIL04	61					
4	F18	17	711		30					
4	F18	22.1	712		37					
8	F16C	37.3	738		38					
6	F16C	26.8	743	KBIL03	29	85	4.67	4.25	-0.42	4
Tanker Added to Meet Time Requirement				KBIL03	Fuel 113.8			5.37	4.95	1
6	F18	25.6	760	KBIL42	50					
4	F18	17	767	KBIL42	31					
6	F18	35.7	778	KBIL42	65					
6	F16C	26.8	789	KBIL41	29					
6	F18	25.5	817	KBIL42	50					
5	F18	22.6	883	KBIL42	31	90	5.77	2.07	-3.70	1
Tanker Added to Meet Time Requirement				KBIL42	Fuel 129.4			4.05	0.35	5
5	F18	34	937	KBIL45	43					
1	F18	6.8	948		9					
8	F18	31.9	970		51					
2	F16C	8.5	988		12	80	3.25	4.32	1.07	4
1	F18	6.8	1014	KBIL14	9	65	1.23	3.15	1.92	1
2	F16C	8.5	1032	KA0437	12					
2	F16C	8.5	1077		12					
2	F16C	8.5	1121		12					
2	F16C	9.4	1208		12					
2	F16C	9.4	1257		12	85	2.42	3.37	0.95	5
2	F16C	9.4	1307	KBIL55	12	35	0.78	2.85	2.07	1

SOLN	
13	tanker sorties orignally required
11	tanker sorties required to satisfy anchor requirements
2	potential consolidation savings

Anchor 16

NUMBER	TYPE	RECEIVER FUEL REQUIREMENT	ARRIVAL TIME	CALLSIGN	SCHEDULED TRACK TIME	TIME MODIFICATION	REQUIRED TRACK TIME	NON-CONSOLIDATED TRACK TIME	TIME DELTA	RECEIVERS PER TANKER
2	F18	8.5	258	KA0443	12					
2	F18	8.5	308		12					
8	F18	44.6	380		64					
4	F18	17	382		34					
4	F18	17.1	390		20					
4	F18	17	426		40					
4	F18	17.1	439		20	65	4.45	9.20	4.75	7
4	F18	27.2	446	KBIL40	25					
6	F18	25.6	475		34					
8	F18	34	481		77	75	3.52	5.32	1.80	3
4	F18	17	496	KA0412	33					
4	F18	22.1	517		32					
4	F18	17.1	557		20					
8	F18	34.1	566		61					
2	F18	13.6	572		14					
8	F16C	33.4	669	KA0436	36	90	4.77	4.18	-0.59	5
Tanker Added to Meet Time Requirement				KA0436	Fuel 118.9			5.27	4.68	1
4	FA22	38.6	681	KBIL61	32					
4	FA22	38.7	696		32					
8	F16C	33.4	711		36					
8	F16C	33.4	753		36					
4	FA22	37.7	774		30	85	4.18	5.15	0.97	5
4	FA22	38.7	789	KA0406	30					
2	F16C	3.7	791		9					
8	F16C	33.4	794		36	75	2.50	4.87	2.37	3
8	F16C	33.4	836	KA0430	36					
2	F16C	3.2	863		9					
8	F16C	33.4	878		36					
2	FA22	19.8	879		14					
2	FA22	19.8	894		14	85	3.23	3.75	0.52	5
2	F16C	2.5	1037	KA0444	9	65	1.23	3.75	2.52	1
8	F16C	9.9	1073	KA0432	68					
6	F16C	8.8	1154		56	40	2.73	5.27	2.54	2

SOLN	
9	tanker sorties orignally required
9	tanker sorties required to satisfy anchor requirements
0	potential consolidation savings

Anchor 17

NUMBER	TYPE	RECEIVER FUEL REQUIREMENT	ARRIVAL TIME	CALLSIGN	SCHEDULED TRACK TIME	TIME MODIFICATION	REQUIRED TRACK TIME	NON-CONSOLIDATED TRACK TIME	TIME DELTA	RECEIVERS PER TANKER
1	E8C	46.1	665	KA0425	20					
1	E8C	46.1	875		20	40	1.33	6.63	5.30	2
1	E8C	46.1	968	KA0460	20					
1	E8C	46.1	1178		20	40	1.33	6.62	5.29	2

SOLN	
2	tanker sorties orignally required
2	tanker sorties required to satisfy anchor requirements
0	potential consolidation savings

Anchor 18

NUMBER	TYPE	RECEIVER FUEL REQUIREMENT	ARRIVAL TIME	CALLSIGN	SCHEDULED TRACK TIME	TIME MODIFICATION	REQUIRED TRACK TIME	CONSOLIDATED TRACK TIME	TIME DELTA	RECEIVERS PER TANKER
4	F16C	14.2	194	KBIL74	28					
2	F16C	8.4	239		12					
2	F16C	9.1	240		12					
2	F16C	9.1	287		12					
8	F16C	21.3	299		30					
6	F16C	27.1	316	KBIL25	58	30	3.03	2.92	-0.11	5
Tanker Added to Meet Time Requirement				KBIL25	Fuel 119.6			4.42	4.31	1
2	FA22	14.9	321	KBIL46	12					
2	FA22	16.5	363		13					
4	F18	17.6	373		20	75	2.00	6.95	4.95	3
2	F16C	9	408	KBIL47	12					
1	EA6B	1.3	413		7					
2	F16C	4.9	420		10					
4	FA22	30.8	421		31					
4	F16C	17.5	455	KBIL44	33					
8	A10A	27.7	470	KBIL44	31	90	3.57	2.92	-0.65	4
Tanker Added to Meet Time Requirement				KBIL44	Fuel 108.4			6.15	5.50	2
8	F18	33.3	470	KBIL20	58					
8	F16C	37.3	486		38					
2	FA22	20	493		14					
2	F16C	9	497		12	80	3.37	6.17	2.80	4
2	F16C	7.8	512	KBIL67	11					
2	F16C	8.5	519		12					
8	F16C	37.3	534		38					
2	F16C	9	542		12					
2	F16C	7.8	554		11					
2	F18	7.9	557		11	90	3.08	6.70	3.62	6
8	F18	43.4	557	KBIL51	58					
2	F16C	8.5	562		12					
8	F16C	37.3	581		38					
2	F16C	9	588		12					
2	FA22	20	589		14					
1	F18	6.8	590		9	90	3.88	5.18	1.30	6
2	F16C	8.5	606	KBIL30	12	65	1.28	6.12	4.84	1
4	F18	17.1	617	KBIL30.1	20					
1	EA6B	1.3	623		7					
8	F18	38.3	623		53					
8	F16C	37.3	628		38					
2	F16C	9	633		12					
2	F16C	7.8	638		11	90	3.85	5.15	1.30	6
2	F15E	23.7	644	KBIL34	14					
6	F16C	24.5	649		65					
4	F15E	38.3	656		23					
1	F18	6.8	656		9					
4	F18	27.2	656	KBIL13	25					
2	F16C	8	661	KBIL13	12	90	3.97	3.60	-0.37	4
Tanker Added to Meet Time Requirement				KBIL13	Fuel 121			5.00	4.63	2
4	F18	17.1	667	KBIL53	20					
2	F16C	9	678		12					
1	F18	6.8	695		9					
1	F18	6.8	706		9					
2	F16C	8	716		12					
4	F18	17.1	716		20					
6	A10A	5.6	720		18	95	3.25	6.80	3.55	7

Anchor 18 Continued

NUMBER	TYPE	RECEIVER FUEL REQUIREMENT	ARRIVAL TIME	CALLSIGN	SCHEDULED TRACK TIME	TIME MODIFICATION	REQUIRED TRACK TIME	CONSOLIDATED TRACK TIME	TIME DELTA	RECEIVERS PER TANKER
8	A10A	27.7	720	KBIL33	31					
4	F15E	38.3	720		23					
2	F15E	23.7	722		14					
2	F18	13.6	728		14					
1	F18	6.8	734		9					
4	F16C	16	742		26	90	3.45	5.78	2.33	6
8	F18	44.3	745	KBIL47	98					
4	F18	17.1	773	KBIL14	20					
4	F16C	16	783		26					
4	F15E	38.3	784		23	80	4.12	3.63	-0.49	3
Tanker Added to Meet Time Requirement				KBIL47	Fuel 90.4			8.15	7.66	1
4	F16C	16	823	KBIL32	26					
1	F18	6.8	850		9					
4	F16C	16	863		27					
2	A10A	1.6	932		8					
8	A10A	7.4	970		23	55	2.47	4.68	2.21	5

SOLN	
18	tanker sorties orignally required
17	tanker sorties required to satisfy anchor requirements
1	potential consolidation savings

Anchor 19

NUMBER	TYPE	RECEIVER FUEL REQUIREMENT	ARRIVAL TIME	CALLSIGN	SCHEDULED TRACK TIME	TIME MODIFICATION	REQUIRED TRACK TIME	NON-CONSOLIDATED TRACK TIME	TIME DELTA	RECEIVERS PER TANKER
4	F16C	18.7	271	KBIL07	21					
4	F16C	18.7	319		21					
4	F16C	18.7	366		21					
4	F16C	18.7	414		21					
2	FA22	14.9	508		12	55	2.52	4.57	2.05	5
8	F16C	31.2	539	KBIL32	68					
2	F16C	7.8	608		11					
6	FA22	56.4	620		60					
8	F16C	31.2	623	KBIL36	80					
8	F16C	13.9	623	KBIL36	26	85	5.50	4.22	-1.28	3
Tanker Added to Meet Time Requirement				KBIL36	Fuel 117.1			5.20	3.92	2
2	FA22	16.8	657	KBIL45	13					
1	F18	6.8	668		9					
2	F16C	8.1	676		12					
6	FA22	56.4	713		60					
4	F18	15.8	720		19					
2	F16C	8.1	722		12	90	3.58	5.39	1.81	6
2	FA22	16.8	735	KBIL33	13					
2	FA22	18.8	744		14					
2	FA22	16.8	812		13					
1	EA6B	1.3	817		7					
1	F18	6.8	823		9					
2	F18	8.5	833		12					
2	F18	8.5	883		12					
2	F18	9.3	883		12					
1	F18	6.8	889		9					
2	FA22	16.8	890		13	110	3.73	6.02	2.29	10
4	F18	17	915	KBIL35	29					
2	F15E	21.5	923		14					
6	F18	30.6	923		48					
8	F18	34.1	937	KBIL07	61	80	3.87	3.67	-0.20	3
Tanker Added to Meet Time Requirement				KBIL07	Fuel 110.5			5.72	5.52	1
8	F18	34	965	KBIL64	83	65	2.47	6.34	3.87	1
8	F15E	85.7	968	KBIL30	82	65	2.45	5.17	2.72	1
8	F18	39.1	989	KBIL66	81					
4	F18	27.2	1003		25					
6	F18	28.4	1047		39	75	3.67	4.95	1.28	3
8	F18	34.1	1050	KBIL17	66					
6	F15E	64.3	1060		58					
2	F15E	21.4	1067		14	75	3.55	4.62	1.07	3
4	F18	17.1	1092	KBIL02	20					
1	F18	6.8	1108		9					
2	F15E	21.4	1127		14					
4	F15E	42.8	1135		30					
4	F18	17.1	1141		20					
4	F18	17.1	1191		20	90	3.38	4.9	1.52	6
2	F15E	21.4	1195	KBIL27	14					
2	F15E	21.4	1203		14					
2	F15E	21.4	1263		14					
2	F16C	6.6	1270		11					
6	F16C	23	1291		58					
2	F16C	8.2	1382		12	60	3.05	3.57	0.52	6

SOLN	
16	tanker sorties orignally required
13	tanker sorties required to satisfy anchor requirements
3	potential consolidation savings

Anchor 20

NUMBER	TYPE	RECEIVER FUEL REQUIREMENT	ARRIVAL TIME	CALLSIGN	SCHEDULED TRACK TIME	TIME MODIFICATION	REQUIRED TRACK TIME	NON-CONSOLIDATED TRACK TIME	TIME DELTA	RECEIVERS PER TANKER
1	E3A	52.3	144	KBIL14	21					
1	E3A	52.3	576		21	10	0.87	2.25	1.38	2

SOLN	
2	tanker sorties orignally required
1	tanker sorties required to satisfy anchor requirements
1	potential consolidation savings

Anchor 21

NUMBER	TYPE	RECEIVER FUEL REQUIREMENT	ARRIVAL TIME	CALLSIGN	SCHEDULED TRACK TIME	TIME MODIFICATION	REQUIRED TRACK TIME	CONSLIDATED TRACK TIME	TIME DELTA	RECEIVERS PER TANKER
2	F18	8.5	70	KBIL06	12					
3	F18	15.3	120		29					
2	F18	8.5	122		12					
2	F18	8.5	163		12					
2	F18	8.5	169		12					
2	F18	8.5	172		12					
6	F18	30.6	198		49	65	3.38	4.12	0.74	7
1	F18	6.8	206	KA0401	9					
8	F18	34	221		70					
6	F18	23.3	229		46					
4	F18	17.1	249		20					
8	F18	44.2	286		83	85	5.22	5.93	0.71	5
6	F18	25.5	297	KBIL10	43					
4	F18	17.1	299		20					
4	F18	17	335		38					
4	F18	17.1	348		20					
4	F18	17	385		37	85	4.05	4.43	0.38	5
4	FA22	38.6	711	KA0402	33					
2	FA22	19.8	745		14					
8	F16C	12	817		25					
4	FA22	38.7	835		31					
2	FA22	18.9	836		14	85	3.37	4.35	0.98	5
4	F16C	18.4	878	KBIL16	30					
2	FA22	18.9	885		14					
6	F16C	27.2	901		36					
2	F16C	7.9	913		11					
2	FA22	19.8	925		14	85	3.17	5.83	2.66	5
8	F16C	30.5	939	KA0433	35					
2	F16C	9.2	943		12					
4	F16C	18	947		20					
4	FA22	37.8	979		31					
8	F16C	30.5	980		35					
4	F16C	18	993		20	90	4.05	5.62	1.57	6
8	F16C	30.5	1022	KA0455	35	65	1.67	5.18	3.51	1
4	F16C	18	1039	KA0440	20					
8	F16C	30.5	1063		35	40	1.58	3.97	2.39	2

SOLN	
10	tanker sorties orignally required
8	tanker sorties required to satisfy anchor requirements
2	potential consolidation savings

Anchor 22

NUMBER	TYPE	RECEIVER FUEL REQUIREMENT	ARRIVAL TIME	CALLSIGN	SCHEDULED TRACK TIME	TIME MODIFICATION	REQUIRED TRACK TIME	NON-CONSOLIDATED TRACK TIME	TIME DELTA	RECEIVERS PER TANKER
2	F18	13.6	167	KBIL15	14					
2	F18	13.6	257		14					
4	F18	22.1	329		42					
2	F18	8.5	336		12					
4	F18	17	385		36	55	2.88	7.50	4.62	5
2	F18	13.6	393	KA0413	14					
2	F18	13.6	395		14					
4	F18	17.1	435		35					
2	F18	13.6	451		14					
2	F18	13.6	459		14					
2	F18	13.6	506		14					
2	F18	13.6	555		14	95	3.57	5.55	1.98	7
2	F18	13.6	559	KA0445	14					
2	F18	13.6	611		14					
2	F18	13.6	621		14					
2	F18	13.6	625		14					
2	F18	13.6	677		14					
2	F18	13.6	819		14	90	2.90	6.32	3.42	6
4	F18	27.2	885	KA0465	42					
2	F18	13.6	979		14					
4	F18	27.2	994		25					
3	F18	20.4	1015		36					
1	EA6B	1.3	1027		7					
4	F18	27.2	1060		25					
2	F18	13.6	1081		14	95	4.30	6.23	1.93	7
1	F18	6.8	1157	KA0403	9					
4	F18	14.8	1184		19					
2	F18	13.6	1207		14					
2	F18	13.6	1273		14	50	1.77	7.50	5.73	4

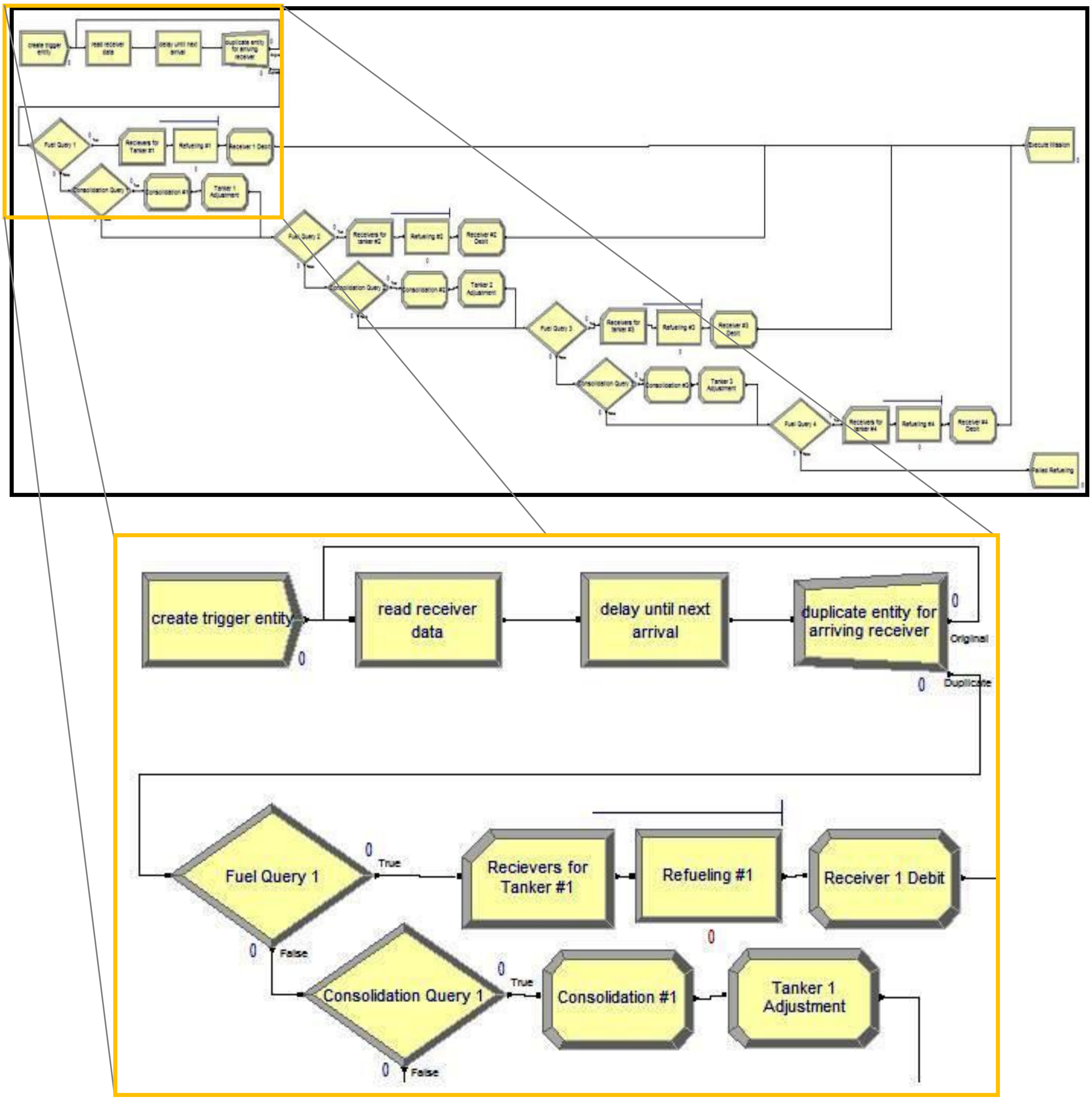
SOLN	
7	tanker sorties orignally required
5	tanker sorties required to satisfy anchor requirements
2	potential consolidation savings

Anchor 23

NUMBER	TYPE	RECEIVER FUEL REQUIREMENT	ARRIVAL TIME	CALLSIGN	SCHEDULED TRACK TIME	TIME MODIFICATION	REQUIRED TRACK TIME	NON-CONSOLIDATED TRACK TIME	TIME DELTA	RECEIVERS PER TANKER
1	E3A	80.3	0	KBIL01	27	35	1.03	3.40	2.37	1
1	E3A	80.3	480	KA0411	27					
1	E3A	40.1	960		27					
1	E3A	40.1	960		27	45	2.10	3.40	1.30	3

SOLN	
3	tanker sorties orignally required
2	tanker sorties required to satisfy anchor requirements
1	potential consolidation savings

Appendix C. Arena Simulation Logic Example



Appendix D. Receiver to Tanker Ratios

Track Number	Total Receivers in Track	Tankers Needed Without Consolidation	Non-Consolidated Receiver/Tanker Ratio	Tankers Needed With Consolidation	Consolidated Receiver/Tanker Ratio
1	39	13	3.000	11	3.545
2	2	2	1.000	1	2.000
3	61	13	4.692	10	6.100
4	37	12	3.083	9	4.111
5	45	10	4.500	7	6.429
6	68	19	3.579	16	4.250
7	20	8	2.500	7	2.857
8	19	6	3.167	5	3.800
9	4	3	1.333	3	1.333
10	73	22	3.318	16	4.563
11	9	4	2.250	2	4.500
12	5	5	1.000	3	1.667
13	18	8	2.250	6	3.000
14	58	17	3.412	15	3.867
15	43	13	3.308	11	3.909
16	32	9	3.556	9	3.556
17	4	2	2.000	2	2.000
18	66	18	3.667	17	3.882
19	50	16	3.125	13	3.846
20	2	2	1.000	1	2.000
21	36	10	3.600	8	4.500
22	29	7	4.143	5	5.800
23	4	3	1.333	2	2.000
			Category Average		Category Average
Totals	724	222	2.818	179	3.631

Non-Consolidated Reciever/Tanker Ratio	
Mean	2.818
Standard Error	0.233
Median	3.125
Mode	1
Standard Deviation	1.117
Range	3.692
Minimum	1
Maximum	4.692
Sum	64.816
Count	23

Consolidated Receiver/Tanker Ratio	
Mean	3.631
Standard Error	0.290
Median	3.846
Mode	2
Standard Deviation	1.393
Range	5.095
Minimum	1.333
Maximum	6.429
Sum	83.515
Count	23

Appendix E. Blue Dart

Major Scott Linck, Student, ASAM
DSN 650-7752, scott.linck@us.af.mil
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Tanker Fuel Consolidation: Impact of Fuel Efficiency on ATO Resiliency

The United States Air Force is committed to purchase the most capable and efficient tanker available to replace its aging KC-135 fleet. One capability required of the new tanker is the ability to receive fuel from other tankers while airborne, a practice referred to as fuel consolidation. Under the operating constraint of reduced budgets and continuing pressure to reduce Air Mobility Command's overall fuel costs, it is likely that future planners will attempt to utilize fuel consolidation to minimize the number of tankers needed for a given Air Tasking Order. Fuel will surely be saved, but at what cost to the resiliency of the air campaign?

As tankers consolidate fuel, and consequently reduce the number of required refueling missions, planners produce a very efficient schedule that becomes increasingly brittle. As more receivers begin to rely on fewer tankers, the loss of one tanker may have an amplified impact on the remaining aircraft in an Air Tasking Order. Schedulers are challenged to balance efficiency and risk to create a resilient schedule. To explore this relationship, a notional Air Tasking Order was simulated to compare the number of tankers required to meet receiver fuel requirements when fully employing tanker fuel consolidation, with one using traditional, non-consolidated, tanker sorties. This will be accomplished by investigating how risk varies as a given receiver population begins to rely on fewer and fewer tankers.

The main portion of the research focuses on the concept of ‘track jumping’; a paradigm allowing tankers in a given track to consolidate freely with other tankers in the track at any available refueling altitude. This is juxtaposed with the more restricted concept of allowing tankers to only consolidate with other aircraft assigned the same altitude within the anchor. This study examines the efficiency potential of each paradigm, identifying which harbors more potential to eliminating tanker sortie requirements through fuel consolidation.

A combination of simulation and time analysis is used to determine the number of tankers required to fill both the needs of track jumping and altitude restricted consolidation paradigms. This process identifies the resultant receiver to tanker ratio and, in turn, identifies the dynamic of risk as it defines resiliency in a given Air Tasking Order.

Air Tasking Orders are currently scheduled to support receiver time requirements. This restricts the ability of tanker planners to develop schedules that take full advantage of tanker fuel consolidation. To identify the extent of available tanker efficiencies, this study takes a contrarian approach and assumes that tanker time requirements drive the Air Tasking Order. This allows full employment of tanker fuel consolidation, but forces receivers to plan their sorties around a tanker planning paradigm.

Assuming tanker availability drives Air Tasking Order creation and ‘track jumping’ consolidation is employed throughout the schedule, tanker sortie requirements can be reduced from 222 to 183 sorties, a reduction of 17.57%. If track jumping is prohibited, tanker sortie requirements can still be condensed, but only by 198/222 sorties or 10.81%. The limits imposed by altitude restriction prevent planners from taking full advantage of the consolidation ability of the aircraft. Using 'track jumping' will help ensure more efficiencies are exploited when employing tanker fuel consolidation. The connection between reduced tanker sorties and increased levels of receiver mission risk must be addressed when employing fuel consolidation.

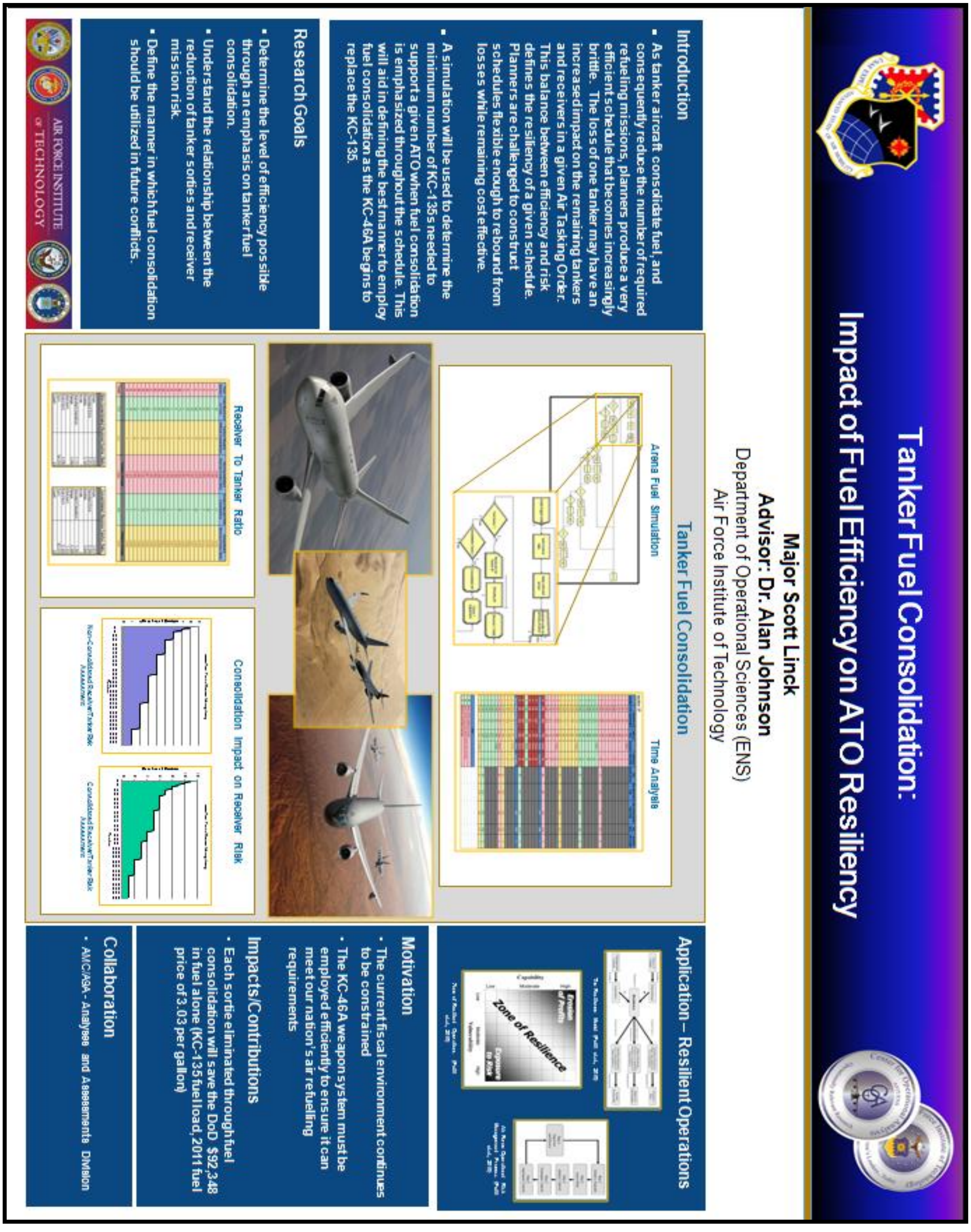
As tankers are reduced, the ratio of receivers refueling with each remaining tanker increases. The study demonstrates that the numbers of tankers servicing 5 receivers and above is higher in a consolidated model than in the non-consolidated model. Specifically, 22.52% (50/222) of the tankers in the non-consolidated model refuel five or more receivers compared to 42.62% (78/183) in the consolidated model. In the consolidated model, the loss of a tanker results in increased levels of sympathetic receiver sortie losses. The remaining schedule is too lean to absorb such losses; the remaining tanker network has little ability to recover due to the lack of operational slack, or excess fuel, in the consolidated system.

Air Mobility leaders may choose to limit the number of tanker sorties eliminated to preserve the needed level of operational slack required to support the air campaign. These decisions are case dependent and subject to the risk tolerance of the involved commanders. The need to balance resiliency with requirements will likely grow more challenging as budgets become more limited. This study serves to highlight opportunities that may enable the Air Force to further stretch its operational dollar while meeting future mission requirements.

"Major Linck is a student in the 2011 Advanced Studies of Air Mobility (ASAM) Class. His next assignment is to Stuttgart, Germany where he will serve as the USTC LNO to AFRICOM."

Keywords: fuel consolidation, track jumping, tanker, KC-46A, air refueling, arena

Appendix F. Quad Chart



Bibliography

"Air Force Announces KC-46A Tanker Contract Award" *Department of Defense News Release*. 24 February 2011. http://www.defense.gov/utility/printitem.aspx?print=http://www.defense.gov/releases/release.aspx?releaseid=14292

Arena Users Guide. Version 12, Rockwell Automation. Computer Software. Rockwell Automation Technologies, Inc. USA, 2007.

Butler, Amy. "USAF On The KC-X Defensive A Year Ago" *Aviation Week.* n. pag. 20 Jan 2010. http://www.aviationweek.com/aw/generic/story_generic.jsp?channel=defense&id=news/KCX031908.xml&headline=USAF%20On%20The%20KC-X%20Defensive%20A%20Year%20Ago

Bolkcom, Christopher & Knight, William. "Air Force Air Refueling: The KC-X Aircraft Acquisition Program." *CRS Report for Congress*. 2008.

Bourgeois, L. "On the Measurement of Organizational Slack" *Academy of Management Review*, 6, 1:29-39, 1981.

Defense Logistics Agency - Energy. *FY 2011 Standard Prices (Effective 1 October 2010)* 17 April 2011. http://www.desc.dla.mil/DCM/Files/DLA%20Energy_files_FY2011_Prices_for_publication.pdf

Department of the Air Force. *Air Force Energy Plan 2010.* Annual. Washington: SAF/IE, 2010. 20 Jan 2011. http://www.safie.hq.af.mil/shared/media/document/AFD-091208-027.pdf

Department of the Air Force. *Air Mobility Planning Factors.* AFP 10-1403. Washington: HQ AMC/A3XP, 18 December 2003.

Department of the Air Force. *Air Refueling.* Air Force Doctrine Document 2-26.2. Washington: HQ AFDC/DR, 19 July 1999.

Department of the Air Force. *Operational Risk Management.* AFI 90-901. Washington: HQ AFSC/SEPO, 1 April 2000.

Garza, Ricardo R. *A Simulation Based Methodology to Examine the B-1B's AN/ALQ-161 Maintenance Process*. Air Force Institute of Technology (AU), Wright-Patterson AFB OH, 23 March 2010 (AFIT-LSCM-ENS-10-04)

Gates, William R. and McCarthy, Mitchell J. *United States Marine Corps Aerial Refueling Requirements Analysis*. Master's Thesis. Naval Postgraduate School. Monterey CA, 2000

Hendricks, Kevin B., Vinod R. Singhal, and Rongrong Zhang. "The effect of operational slack, diversification, and vertical relatedness on the stock market reaction to supply chain disruptions" *Journal of Operations Management.* 27:233–246, 2009.

Isherwood, Michael. "The KC-X Opportunity." in *Armed Forces Journal.* Ed. Tobias Naegele. Springfield VA, 24 September 2007.

KC-X Tanker Modernization Program. *Solicitation Number: FA8625-10-R-6600* 24 February 2011. https://www.fbo.gov/index?s=opportunity&mode=form&tab=core&id=d5299c5808621b6bf90fbf3a05589032&_cview=0

Kleindorfer, P.R., Saad, G.H., "Managing Disruption Risks in Supply Chains" *Production and Operations Management Journal* 14:53–68, 2005.

Lee, H., "The Triple-A Supply Chain" *Harvard Business Review* 82:102–112, 2004.

MacDonald, Mark J. *Handbook for Tanker Employment Modeling.* Air Force Institute of Technology (AU), Wright-Patterson AFB OH, June 2005 (AFIT/GOS/ENS/05-11)

McClave, James T. and others. *Statistics for Business and Economics Eleventh Edition.* Boston, Prentice Hall. 2011.

Pettit, Timothy J., Joseph Fiskel, and Keely L. Croxton. "Ensuring Supply Chain Resilience: Development of a Conceptual Framework" *Journal of Business Logistics*, 31,1:1-21, 2010.

Project Management Institute (PMI). *Project Management Body of Knowledge (PMBOK) Guide.* Newton Square PA: The Project Management Institute, Inc., 2004

Ragsdale, Cliff T. *Spreadsheet Modeling & Decision Analysis: A Practical Introduction to Management Science 5e Revised.* Ohio, Thomson South-Western. 2008.

Szabo, Pete. Chief, Analyses and Assessments Division HQ AMC A9A, Scott Air Force Base, IL. Personal Correspondence. 12 Aug 2010.

Vigus, Steven E. *A Simulation-Based Analysis of the Impact of in-Sourcing a Major Process Element on the Coast Guard HH-60J Depot Maintenance Process*. Air Force Institute of Technology (AU), Wright-Patterson AFB OH, 27 Aug 2003 (AFIT/GAQ/ENS/03-03)

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Linck, Scott C. Maj USAF

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Air Force Institute of Technology
Graduate School of Engineering and Management (AFIT/EN)
2950 Hobson Street, Building 642
WPAFB OH 45433-7765

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Mr. Peter Szabo/ Air Mobility Command/A9A
1 Soldier Way (JDPAC)
Scott AFB, IL 62225
DSN: 770-7769 email: peter.szabo@scott.af.mil

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14. ABSTRACT

The United States Air Force is committed to purchase the most capable and efficient tanker available to replace its aging KC-135 fleet. One capability demanded of the new tanker is the ability to receive fuel from other tankers while airborne, a practice referred to as fuel consolidation. Under the operating constraint of reduced budgets and continuing pressure to reduce Air Mobility Command's overall fuel costs, it is likely that future planners will attempt to utilize fuel consolidation to minimize the number of tankers needed for a given Air Tasking Order (ATO). This study examines the impact of consolidation in both a free and altitude restricted paradigm within specific anchors. It identifies the employment method which generates the greatest amount of operational efficiencies while examining the changes in associated receiver mission risk. It recommends the use of 'track jumping' to achieve the greatest levels of operational efficiency and suggests Air Mobility Command planners begin using consolidation as soon as available both to explore the paradigm and reduce fixed costs within air campaigns.

15. SUBJECT TERMS

Tanker, Resiliency, Consolidation, Anchor, Track Jumping, Arena

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					19b. TELEPHONE NUMBER *(Include area code)* 937-255-3636, x4703 email: alan.johnson@afit.edu

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